

MUNICIPAL JOURNAL AND ENGINEER

Copyrighted, 1901, C. M. Palmer, New York

VOLUME XI

NEW YORK, DECEMBER, 1901

No. 6

PLANNING AND EQUIPPING MUNICIPAL RECORD ROOMS

Many Points to Be Considered—All Openings a Menace and Require Protection—Some Things Often Overlooked—
“All Must Be Fire-proof or Nothing Will Be Fire-proof”—Two-fold Object to Be Attained

By M. S. Kelley

SECOND, EMPLOYMENT OF STRUCTURAL FEATURES

THIS involves not only a consideration of how fully the structural parts of the building may be utilized, but also what modification of the following features should be made in builders' specifications, to secure the best results; viz.,

ENCLOSING WALLS OR PARTITIONS

(a) Walls. Enclosing walls or partitions for record rooms should be of brick, a point to be observed in drawing builders' specifications. These walls should be of good thickness, the nature, size and fittings of adjoining rooms to be considered. For example, wooden fixtures could be placed in a large room adjacent to a record room, sufficient, under combustion, to generate heat enough to penetrate a brick wall twelve to sixteen inches thick. This, without attacking the integrity of the wall itself. It is to be observed, however, that as only metal or other non-inflammable fixtures are ever used in record rooms worthy of the name, there is not the danger of fire communicating in this way, found in ordinary rooms. Walls, therefore, need not be of excessive thickness for this purpose. Four-inch tile partitions are not suitable for enclosing fire-proof rooms. If used at all, they should be reinforced, and of porous rather than of hard burned clay. The former holds plaster better, and experience has shown it will stand severe tests. In all cases they should pass through the flooring and rest upon fire-proof beams and arches in such manner as to effectually cut off any passage of fire from adjacent rooms.

Large and important registries, however, can advantageously be located on or near the ground floor, with party walls carried direct to foundations. These

should be from 16 to 24 inches thick, and set in cement mortar. This plan will also provide for convenient storage vaults for overflow matter from departments above. The length of the walls and the introduction of cross walls, or supporting piers, or buttresses, should also be considered in determining thickness of walls required.

ALL OPENINGS SHOULD BE PROTECTED

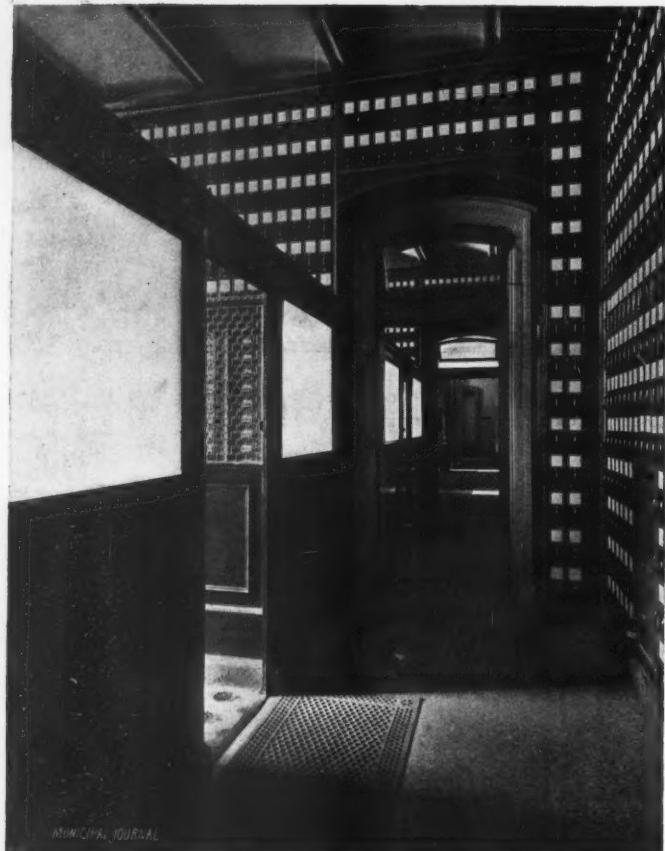
(b) Openings in interior walls and windows. As in theory, the inclosing walls of fire-proof rooms should offer all the protection afforded by solid unbroken brick walls of vaults, it follows that all openings should be so protected that when closed the room becomes a fire-proof cube. Openings to interior light shafts should be discouraged and those at doors or openings to book lifts supplied with some efficient form of fire stop. The use of wooden doors covered with metal is not advocated for this purpose. This form of fire stop is one of the best offered, and in special instances may be introduced (in a sliding form) into pockets in walls, or, where all the doors and frames in building are wood, metal covered, those for record rooms, specially reinforced, may be made uniform with the rest. Speaking generally, however, this type of door does not lend itself most readily to the requirements of this class of rooms. Wooden trim ought to

be conspicuous by its absence in any first-class municipal building, but where it is supplied in corridors from which record rooms open, the ordinary (or day) doors leading to hallways may be made uniform with others adjoining, and the opening back of them protected by coiled steel shutters. Pockets for these should be provided in walls over the doors, and during working hours the shutters can be out of sight and out of



RECORD ROOM OF PROBATE COURT CAMBRIDGE, MASS.

UOFM



CORRIDOR OF SERIES OF RECORD ROOMS, PHILADELPHIA CITY HALL

the way. If these are made double; that is, two distinct curtains provided, to run in deep channel iron guideways, with an air space between the two, no danger from these points need be feared. Curtains made of separate slats with beaded edges, the bead on one edge enough larger than the other to permit their being slipped together in a smoothly working hinge, with room for expansion under heat may be provided, and the liability of warping largely reduced. It may be urged that in cases of sudden danger they could not be closed as readily as doors; but such contingencies are more liable to be apprehended from the exterior than the interior of a fire-proof building. The number of doorways to record rooms should be rigidly restricted, and whatever form of fire stop is adopted it should be made to work.

Windows to record rooms should, of course, have metal or metal-covered frames and sash, riveted—not soldered. Wired glass will serve as a sufficient fire retardant in any sudden danger, and special protection is afforded if they are set in double sheets with an inch air space between them. The openings in the rear of sash should, however, be provided with coiled curtains or an equally efficient fire stop. The point sometimes made against solidly closed openings of this kind, that it is difficult to detect fires within rooms so closed, may be discarded in this connection. No fire can originate in a properly equipped record room. It is obvious that provision should be made to cover these points in the builders' contract. The danger of fire ascending from one story to another by the way of windows in outer or court walls is not sufficiently appreciated. This danger has been repeatedly illustrated in recent fires in fire-proof office buildings in New York, nota-

bly those in the Metropolitan Cable Building, the Temple Court, Livingston Buildings and others. It would hardly seem necessary to urge that all openings, when rooms are not in use, should invariably be closed. Experience has shown, however, not only in public buildings, but elsewhere, that there is often a lack of attention paid to these points.

The positive necessity for thorough protection at exterior openings from outside fire in all public buildings may in some cases modify architectural details of façades, but not essentially. There is not the necessity for extremely large window openings thought to be requisite for the display of goods, etc., in mercantile buildings.

PROTECTION FOR STEAM, GAS AND OTHER PIPES

(c) Ducts for piping, wires, etc. Rising steam, gas or other pipes, electric wiring, etc., should at each floor be protected by a metal sleeve, and all open spaces about it filled with some expansive fire-proof material to cut off flame and smoke. This is a point often overlooked. Fire has frequently travelled through these ducts, a good portion of one floor in the General Electric Building on Broad street, in New York, being burned out in this way in 1892. The same danger was illustrated in a recent fire in the Mills Building, New York, where the fire skipped one floor where it was cut off, igniting the second floor above.

(d) Ventilating shafts and ducts. Special care should be given to cutting off all danger of fire or draughts at ventilating openings. Slats should be riveted, not soldered, and the frame work should flange well over the opening. It would be well if provision could be made to have all registers close automatically in case of danger. Shafts, flues and book lifts should be constructed in the most substantial manner with all openings protected.

(e) Floors. A special point to be considered in relation to floors is the extra weight imposed upon them by metal and marble fixtures. This is a point frequently overlooked. Before fire-proof rooms could be equipped in some of the latest and best built buildings, it has been found necessary to reinforce floors to carry the equipments. The great City Hall in Philadelphia, containing some of the finest fire-proof record rooms in the world, has numerous floors so reinforced, a work always attended by expense, inconvenience and some loss of architectural symmetry. Top flooring should be tile or marble, or when a more yielding material is desired, asbestos or interlocking rubber tile may be used. Fixed furniture, however, should always have a stone or tile bearing. Where wooden floors are used, wooden sleepers should be discarded, and floors laid without open spaces between the under side of boards and top of fire-proof arches. Such openings afford a passage for flame and supply a harborage for rats and mice, to which it is possible they may carry matches or other



MODEL FIRE-PROOF RECORD ROOM, PHILADELPHIA CITY HALL—EVEN THE DESKS ARE MADE OF METAL

combustible material, to be ignited by spontaneous combustion or by steam pipes. These spaces should be filled with the best Portland cement concrete. A recent writer has pointed out that these floors should be water as well as fire-proof; the concrete being so laid that all water will run to the sides of building and be carried off by scuppers which may be arranged with pipes through the walls, having a check valve which would prevent the influx of cold air and yet admit of the outflow of water. This provision at least should extend to all floors *over* record rooms.

(f) Lighting. All artificial lighting for record rooms should be electric. Gas is not only injurious to book bindings, but its presence offers opportunities for explosions. Wires should not only be insulated, but run in insulated conduits, as provided by the rules of the National Board of Fire Underwriters, to be procured in every city. If provision is made for a complete disconnection outside of rooms, all danger from leaking currents will be avoided.

INTERIOR EQUIPMENT OF RECORD ROOMS

Given, record rooms structurally fire-proof, how shall they be equipped?

One axiom completely covers the entire question. "All must be fire-proof or nothing will be fire-proof." There should be absolutely nothing in record rooms to burn. Books and papers should be so protected that they *cannot* burn. All interior trim should be stone, metal or metal-covered wood. As to fixtures, metallic cabinet work is now made in all forms for this purpose, and its use completely negatives interior fire risks. It possesses the decided advantages also of great durability, economy of space in construction, is impervious to vermin and microbes and readily kept clean. No wooden fixtures of any kind should be employed. The ratio of security is in exact proportion to the amount of combustible materials excluded.

The full utility of incombustible interior work, particularly metallic cabinet work, has not always been realized, owing to the failure to adopt constructional features in fire-proof buildings to its use. Too often metallic fixtures and record cases have been scattered promiscuously

ously through open rooms, having wooden doors and trim, with more or less adjacent wood furniture. The seeming intention has been to rely directly on metal fixtures for fire protection. The construction of the building itself should substantially provide for this as against external fires, or fires in other portions of the building.

TWO-FOLD OBJECT TO BE ATTAINED

The province of incombustible interior fixtures from the standpoint of fire is two-fold:

First, and mainly, To prevent all internal fires in rooms in which they are used.

Secondly, To prevent any introduction of external fire or spread of flames from other parts of the same building. While substantial metallic fixtures offer a large measure of protection in themselves, strictly speaking they cannot be termed fire-proof, though entirely non-combustible. Record rooms can be said to be fire-proof in the best sense, only when incombustible fixtures are employed exclusively, with no "starting point" for fire as a primary principle, and in buildings whose structural features have been designed to serve their part in a general scheme for protection. All records should be "grouped" as largely as possible; that is, those of each department brought together in a general filing room. While in some cases this might not serve individual convenience most fully, it would guarantee better care of the records as a whole, and the first element connected with their custody should be security. Where isolated record cases are placed in rooms equipped with wooden fixtures their construction should furnish special protection.

No municipal expenditure will be more cordially endorsed by the taxpayer than that which provides for the complete security of the titles to his property, the statistics of his family and the official history of the city of which he is a part. Any plan or equipment for record rooms that fails to completely accomplish this, will eventually certainly meet with an equal degree of public disapproval.

THE END

HOW TO IMPROVE MUNICIPAL GOVERNMENTS

**Business Principles Needed—Salaries Must Be Earned—Appointments Made on Merit, Not "Pull"—Obtain Honest Competition in All Bids—Board of Experts Should Make Up Annual Budget
—How the Plan Works in Baltimore**

By Thomas G. Hayes *

It is a cause of sincere regret that in this, our great country, we have failed to bring our municipal governments to the highest standard. Thinkers attribute various causes for this deficiency in the government of our great cities. It is a vital question with the people of our municipalities how to improve their local governments.

My brief experience, as the executive head of a large municipality on the Atlantic seaboard, with over one-half million population, has led me to believe that municipal governments may be improved by adopting business principles in the administration of these governments.

SINGLE HEADED RESPONSIBILITY

A first prerequisite to accomplish any improvement in city government is that the mayor is in fact, as well as in theory, the directing head. He must be mayor, and nobody else. If any mayor consents to be controlled by any power behind the throne, whether this power be political or otherwise, his efforts to improve his city government will be a failure. This failure results from a substitution for the mayor's individual will that of another, who is without responsibility, and who has no desire or purpose to make the public welfare the controlling motive of action. More than this, if this hidden power is political a political machine is set up as the governing agency, with no regard for the public interest, but rather for profit and gain to its members, instead of an honest and economical governmental agency entrusted with the administration of the people's government.

I know no reason why business principles may not, with the same propriety, be applied to municipal corporations as to private corporations. The duties incident to municipal government are not political; that is, they do not involve questions of party principles which divide the great national parties. The fact that a man is a free trader or protectionist, a gold or free silver advocate does not enter into his equipment as a suitable person for the mayor of a great city. Cleaning the city, lighting the gas and gasoline burners, giving fire protection and protecting the public health can be rendered by men who are honest, and who give faithful and economical service, irrespective of their political creed.

While I am of the opinion that no political principles enter into the administration of municipal government, yet I am fully convinced that improvement in municipal government is to be had from one or the other of the two political parties. Independent or reform movements are always short-lived, and after one success the relapsing of the municipal government into the old ways is even worse than before. While this, I believe, is true as to independent political movements, I believe that the greatest benefit results from a large number of independent voters in any community. These independent voters are a balance of power which each regular party organization, by a superior class of nominations, will always endeavor to bring to the support of its ticket.

THE CAUSE OF BAD CITY GOVERNMENT

The chief source of bad city government is bad business methods.

* Mayor of Baltimore.

MUNICIPAL JOURNAL AND ENGINEER

of administration. The business principles which are successfully used in conducting any large business may be applied with greater benefit to municipal administration. Many believe that bad city government results solely from political and social causes. This is not altogether true. A city may be free from political and social evils, and yet lack business methods in administration, and thereby be far from a well governed city.

One of the first business principles that I would suggest as essential to a business administration is, that every appointee in the municipal government, whether made by the mayor or the head of a department, must know that his appointment is made because such appointee is believed to be fitted to give faithful service in the position he has received, and that his tenure of the office depends solely upon faithful service, and that as long as he gives honest and faithful service so long, and only so long, will he retain his position. Municipal appointees must know at the beginning that their appointment is not made to reward political service. The further fact must be impressed upon such appointee that no political influence, directly or indirectly, can avail to retain such appointee in office, but that faithful service alone is the controlling influence which fixes both his appointment and his future tenure. This rule for the government of the appointing power is vital if a business administration is desired, and the reason for this statement is apparent. If municipal appointees feel that they owe their appointments to political influence then it is this political influence that controls, and must be pleased, entirely independent of the public service. Nothing could be more destructive of business principles than this belief on the part of municipal appointees.

SELECTION OF MEN BESET WITH MANY DIFFICULTIES

It is not an easy undertaking to make many thousand appointees independent of political influence, yet I feel that, however great the undertaking, it can be done, because it has been done in my home city. The appointee's party fealty and allegiance are not interfered with, but he is made to know that party influence has no weight in obtaining the office, or in keeping the occupant in office.

There is no reason why a municipal appointee should not render the same full and faithful service as he would render if employed by a private employer. For an economical administration of a city government it is essential that full and faithful service should be rendered by every municipal employee. This full and faithful service will never be obtained if the employees feel that their positions are obtained as a reward for political service.

Having observed this requirement as to the appointment and tenure of municipal appointees, the next important consideration is, what is to be the compensation paid the municipal employees? The rule which should be followed is that the pay of municipal employees should be the same as is paid for similar service in private employment. There is no sound reason which can be given why, for similar service, a municipal employee should be paid more than is paid in private employment. Why should an elevator man be paid \$900 per annum when but \$700 is paid in private employment for the same service; or a carpenter, blacksmith, stenographer or paver be paid more when his employer is the municipality, and not private?

THE IMPORTANT QUESTION OF SALARIES

When entering upon the duties of the Mayor of Baltimore, in connection with the City Council I made a careful examination of salaries paid municipal officials, and the reduction resulting from this investigation is set forth in the following extract from my message, of September 17, 1900:

"It is to be noted from this statement that of this total reduction, \$6,676 was a reduction in salaries. The rule followed in making these salary reductions was to ascertain, if possible, what similar service was paid in private employment, and to fix the salary at these figures. For instance, it was ascertained that in private employment no elevator man was ever paid more than \$600 or \$700 per annum. The salaries of the municipal employees in this service were reduced from \$900 per annum then paid, to these private employment prices. This rule was rigidly followed in each case, and no salary was reduced where the amount was not in excess of similar service in private employment."

In carrying out business principles in municipal government it is of the first importance that the heads of departments, who are always appointed by the mayor, should be men in touch with the business policy of the mayor. These heads of departments run, and are responsible for the conduct of their respective departments, and under the charter of Baltimore appoint all their subordinates.

If these heads of departments are men who can be controlled by the politicians (and they will be if appointed by the mayor on the recommendation or influence of the professional political class) then all effort of the mayor, however honest he may be, to improve the municipal government by giving a business administration, may be at once abandoned, for with such departmental heads the purposes or efforts of the mayor will be thwarted.

The fault of the mayor will be in making these appointments. How is it possible for merit to be the test of appointment of subordinates when the chief of the department who makes these appointments is himself the tool of a political boss?

How can business principles be adopted and followed in municipal administration when each department is a dumping ground for the heelers of a political leader?

In the administration of the government of Baltimore I at the start selected as my departmental chiefs men who were well equipped for the special service of their respective departments, and who were unknown to the politicians. The politicians endorsed men for all departmental heads, but I was careful not to appoint one who was so endorsed. My selection of departmental heads caused not only a howl among the politicians, but abuse from this class without measure upon the executive head of the city's government. Fortunately this howl and abuse did not deter the Mayor from appointing the men whom he had selected for departmental chiefs, who were men with whom the public service was the sole rule of action for administering their respective departments.

MANNER OF PURCHASING SUPPLIES OR MATERIALS

Another important business principle that must be rigidly followed in city government is to see that all supplies or materials are purchased after public notice, and the broadest competition.

The benefits of following this rule are apparent. Competition brings the lowest prices and the best material and supplies. It does more; it kills favoritism in making purchases, and prevents vendors from attempting to corrupt municipal officials. A contractor would not hesitate to offer a commission or other rake-off to a municipal official to procure the trade of the city. This corrupting influence is destroyed if the purchaser knows it cannot aid him in getting the contracts. The municipal body to make these purchases should not be the department which requires the materials or supplies, but a municipal board which can be neither bought or bossed, and independent of the department requiring the materials or supplies. The bids should be sought, after full advertisement in the daily press for a reasonable time, on specifications prepared by the department, and subject to review by the board which finally awards the contract.

Too much attention cannot be paid to this matter of awarding contracts, as the experience of all municipalities is that this is a prolific source of corruption and robbery.

In the Baltimore charter the provision which meets this requirement for the awarding of contracts to the lowest responsible bidder, after advertisement, is wise and ample. This organic law provides for a Board of Awards, composed of the Mayor, Comptroller, City Register, President second branch City Council and City Solicitor, who are required to award all contracts for any public work, or the purchase of any supplies or material involving an expenditure of five hundred dollars or more. This law requires that this board shall ask for bids in an advertisement, published in two daily papers of Baltimore city for not less than ten days, nor more than twenty days, and that this board, at the appointed time, shall in public open all these bids, and award the contract to the lowest responsible bidder. These bids are made on specifications furnished by the department requiring the work or materials, which specifications are examined, modified or altered so as to ensure the fullest competition, and then approved by this board.

SYSTEM OF AWARDING CONTRACTS

This Board of Awards is composed of three municipal officials,

elected by the people; namely, the Mayor, Comptroller, who is head of the Department of Finance; President second branch City Council, the City Register, who is treasurer of the city, elected by the City Council, and the City Solicitor, a lawyer of prominence and character and head of the Law Department. The personnel of this board ensures integrity and impartiality in carrying out its responsible duties. In practice this system has worked admirably. No one of the half million people of Baltimore would say or intimate that this board has not faithfully performed its duties, and that the taxpayers' money for public work and supplies has not been spent wisely and well. Competition, by this system, has been ensured, and the lowest prices paid, and not a contractor has dared even to offer to a member of this board a commission or rake-off of any kind whatever. Indeed, the vendors of municipal work and supplies throughout our country know as a fact that if they want to furnish Baltimore with their work or supplies, their price and quality alone render it possible for them to be successful bidders.

It is to be noticed that the system as given applies only to contracts for five hundred dollars or more. Heads of departments buy when the amount is less. I have instructed all heads of departments to follow the same system purchasing work or supplies as is followed by the Board of Awards, and this rule is faithfully followed and obeyed.

Another business principle which is of benefit, and which the municipal government of Baltimore strictly follows, is, that when any private person or corporation desires to use any of the public property of the city they must pay the highest price that can be obtained for it. No street railway can use an inch of any street in Baltimore until it has paid the price fixed by the Board of Estimates, and then the grant of the use is only for twenty-five years. So with any other use of the streets by bay or bow windows, drains or subways below the surface of the streets.

This system not only brings a revenue, but requires compensation where public property is used. Nothing could be fairer than to require a private person or corporation, who desires to use the streets for its benefit, to pay the full market price for the use.

EXPENDITURE OF PUBLIC FUNDS

The expenditure of money by a municipality, under existing municipal systems, is always attended with many evils and extravagances. The annual budget had better be made up by a board of experts rather than is usually done by the Ways and Means Committee of the City Council. Influences are exerted over members of a committee of a city council which often are most injurious to the public interests. Again, the individual responsibility is not felt in a large body, as the city council, while it is felt when a select few are held responsible for all moneys spent. There is not one cent of money spent in Baltimore in any year but what is first passed upon and appropriated by a Board of Estimates, composed of the same members as the Board of Awards, except that for City Register is substituted for the City Engineer. The appropriation of this money is made by an ordinance, passed by the City Council; but this City Council cannot increase a single item in the ordinance, as transmitted by the Board of Estimates. This system has worked admirably, and in the first ten months of the present administration there was saved to the taxpayers of Baltimore the sum of \$771,502.59, and taxes reduced from \$2 on the \$100 to \$1.67 for the first year, and \$1.81 $\frac{1}{2}$ for the second year. This saving is set forth in detail in the following extract from the message previously referred to:

"Taking all the items of saving in the different sub-departments as specifically set forth in this message, and adding them together, it will be found that the total saving during the present administration is \$771,502.59, being over three-quarters of a million of dollars. This total is made up of the following items:

Reduction in pending ordinance of estimates.....	\$290,195.61
Supplemental ordinance of estimates (Water Board).....	27,200.00
Present Water Board.....	218,000.00
Commissioner of Street Cleaning.....	4,078.31
Harbor Board	2,627.00
City Librarian	250.00
Board of Awards (printing, etc., departments).....	7,863.12
Board of Park Commissioners.....	3,800.00

Superintendent of Lamps and Lighting.....	200,000.00
Board of Fire Commissioners.....	14,488.55
Comptroller	3,000.00
Total	\$771,502.59

"This economy, put in operation by the above-named sub-departments and municipal officials not embraced in a department, is most pleasing to me, especially when I know the public service has in no wise suffered by reason of this economy. To know that this administration has saved by an economical conduct of the city government over three-quarters of a million of dollars of the taxpayers' money is ample proof of the wisdom of the application of strict business principles to the administration of municipal government. My thanks, as well as the thanks of the people of Baltimore, are due to these faithful municipal officials, who in the economical administration of their respective departments acted upon the belief and principle that a public office is a public trust, and that a trusting and confiding people should have from them absolute fidelity to their interests in administering this trust. This total does not include the many other economies practised in all the sub-departments and which are referred to in this message. In addition to this large saving must be remembered the fact that the tax rate has been reduced 33 cents in the \$100; that is, from \$2 to \$1.67 in the \$100."

MANAGEMENT OF THE FINANCES

The management of the finances of a great municipality is another matter of the first importance. A great city like Baltimore which spends this year for current expenses \$8,938,941.86, and with a bonded indebtedness, which is gradually maturing, of \$40,000,000, requires wisdom in the management of its finances.

The best business rule to follow in raising money and paying debts is to run your municipal government on a cash basis. This means to pay as you go; have no temporary loans, and the consequent dangerous and abominable floating debts. To accomplish this the city's income or revenue must be received coeval with incurring of municipal liabilities. If the fiscal year is the same as the calendar year then the receipt of taxes and other revenue must begin on the 1st of January, so that money may be on hand to meet liabilities as they are incurred. This means that your taxes must be levied before the beginning of your fiscal year, so that on the 1st of January taxes must be collectable, and the money on hand ready to pay the bills when they are due. This we do in Baltimore with admirable results.

Again, another business principle which is helpful in the conduct of municipal government is, to do city work when it is susceptible of so being done, by contract, with a reservation of municipal supervision. The benefits of this system of contract are numerous. The work is done by a private contractor much more economically. A private employer gets better service from the employees than the government.

A FEW ILLUSTRATIONS

Let me now give you a few illustrations of these beneficial results, which we have quite recently experienced in Baltimore, from the contract system. In the matter of supplying electric lights to the city, Baltimore has about 1,500 electric lamps. Prior to the present administration there was paid for each light per year \$127.75. The city authorities demanded a reduction in price. An advertisement was inserted asking for contracts for lighting the city with lights with equal candle power to existing electric lights, not excluding electric lights, and also threatened the Electric Company with establishing a municipal electric lighting plant if a reduction was not made, and as a result we obtained a contract reducing the price to \$99.92 per light per annum, saving to the taxpayers the sum of \$41,745 per annum. A similar effort was made as to the service of attending to and lighting 6,200 gas lamps, which resulted in the saving of the difference between \$23.84 per lamp paid for this service before this administration and \$14.15 per light now paid. This would, for one year, with 6,200 gas lights, make a saving of \$60,078 to the taxpayers. Efforts were also made to compel the gas makers to reduce the price of gas furnished the city. The price fixed by law, which the company could not exceed, was \$1.10 per 1,000 feet. The result of this effort was a reduction to 89 $\frac{1}{2}$ cents per 1,000 feet, with a saving to Balti-

more in money paid for gas consumed of \$10,292 per annum. For the removal of the garbage and ashes the city paid \$177,800 per annum. Advertisements were made for bids for removal of this garbage and ashes by contract, and the lowest bidder offered to do the work for ten years at \$148,000 per annum, making a saving of \$29,800 per annum, and to him the contract was awarded, and he is now doing the work of removal of all garbage and ashes from the city. The contractor for the removal of garbage, under his contract, is required to remove the garbage in the most improved sanitary carts, purchased by himself, and also to build at his own expense a plant of improved device to destroy or burn the garbage. A municipal official retains supervision and control over the work done by this contractor. The contractor is required to do whatever the municipal official demands, so as to ensure the best service.

PROVISIONS OF THE PRESENT CHARTER

The government of the city of Baltimore, since the 24th of March, 1898, has been administered under a new charter, the provisions of which are most admirable, and which have been an important factor in bringing the improvement to the city government, of which I have spoken. The commission which drafted this charter sets forth the principles which controlled them in the following eight propositions:

"1. To locate responsibility upon public officials in such a manner that it could not be evaded.

"2. To give representation to the minority party in all departments, when composed of more than one person, so that an opportunity might be given to the minority to scrutinize the actions of the party in power.

"3. To hold municipal elections at a different time from the State and Federal elections, in order to separate municipal affairs from the influence of the political issues which are necessarily involved in State and Federal elections.

"4. To require the appointment of experts in all departments where professional knowledge and skill are required.

"5. To grant the use of the streets and other public property for limited terms, and to the highest bidder, subject to the control and regulation of the city during the period of the grant.

"6. To check hasty legislation, especially in matters relating to expenditure of the public moneys, and to prohibit the creation of floating debts.

"7. To remove the public school system from all possible political influence.

"8. To place the indigent sick and poor, when their treatment, care or support is paid for by the city, under the supervision of city officials."

I desire to leave with you another suggestion. If you desire to aid in improving city governments you must assist in arousing civic spirit and interest among the people. Why should not the people love their local government as much as the state and national government? Patriotism includes municipal affairs as much as national and state affairs.

I believe that by the proper effort there is in store for the government of the cities of our country a bright future, and that we will be able to teach the world how to best govern cities, as we have how to establish the freest and best national government that the sun has ever shone upon.

WOODEN PAVEMENTS AT HOME AND ABROAD

Bad Materials and Methods Caused First Failures—When Properly Laid Give Perfect Satisfaction—As Demonstrated Here and Abroad—Slight Wear and Small Charge for Maintenance

By Frederic Arnold Kummer, Jun. Mem. Am. Soc'y. C. E.*

IN this country wooden paving has had three distinct phases. The first step was an improvement on the corduroy road. It converted a mudhole into a passable way. The round or hexagonal blocks were not treated, consequently they rotted. They were one-third sap wood, consequently they rounded quickly on the edges. They were highly unsanitary because they absorbed street filth. They sank into ruts and holes because they had no foundation; but they were cheap; they eliminated the mudhole, and in that way served a good purpose.

THE FIRST IMPROVEMENTS

It occurred to some enterprising genius to improve this pavement by squaring the blocks and dipping them in tar. This form of pavement, generally known as the Nicholson block, was extensively laid in many cities to their great and lasting sorrow. Why anyone should have anticipated success with such a pavement is almost incomprehensible. In the first place, little or no care was taken in the selection of the timber; hard and soft, heart wood and sap, seasoned and unseasoned, all woods looked alike to the promoters of the pavement. A dipping in hot coal tar or pitch served to cover up the defects, and incidentally to seal up with the wood the moisture due to lack of seasoning, thus hastening dry or heart rot as much as possible. The introduction of laths between the blocks served to make large joints, and thereby to admit as much water as possible under the pavement. Sometimes the pavements rolled in billows like the sea. At this stage they were generally thrown away. The use of untreated planks on earth as a foundation was ingenious in its insufficiency. That part of the pavement that was not heaved up by the frost, went down by the rotting of the planks.

THE CONCRETE FOUNDATION INTRODUCED

As a third phase, creosoted wooden blocks on a proper concrete

foundation have begun to be laid in a few places throughout the country. This is really a wooden pavement. The other was wood, but it was not a pavement. A block of well-selected heart pine, preferably the long leaf or Georgia pine, creosoted with not less than 110 pounds of dead oil to the cubic foot, and laid on concrete with a thin sand cushion, if any, and water-tight joints, will make a good and durable pavement, not slippery, not in the least noisy, sanitary because of its antiseptic treatment, durable, easy for horses and pleasant to drive over. It has been largely and very satisfactorily used in several Western and Southern cities, notably Indianapolis, Terre Haute, Galveston and New Orleans. In Indianapolis the experience of six years' service has been highly satisfactory, the pavement showing increased popularity over all other forms of roadway. Over 50,000 yards have been contracted for there this year alone.

Briefly, this constitutes about the history of the three stages of wooden pavements in this country. The pavements recently laid in Boston and other points in the East constitute, in the writer's opinion, the beginning of a fourth stage, which will revive the interest in wooden pavements to such an extent that they will rapidly take the prominent place which they deserve in the estimation of the tax-payers, as well as of the city officials.

LONG USED WITH GOOD RESULTS IN EUROPE

The history of wooden pavements abroad is a long one, and within the limits of this paper can only be briefly treated. The two most important cities abroad being London and Paris, perhaps we may as well confine ourselves to those points, although many other cities in England and on the Continent, as well as in Australia, use wood in large quantities. In Germany, however, wood is not so popular as elsewhere on the Continent. In Paris the wooden blocks are all manufactured and laid by the city authorities, the various plants having a capacity of 47,000 blocks per day, or about 1,000 square yards. These blocks are of two depths, 15 centimeters, or about 6 inches for the softer varieties of wood, and 10 centimeters or about 4

* Of 29 Broadway, New York, who read this paper before the eighth annual session of the American Society of Municipal Improvements, held at Niagara Falls, N. Y., October 1 to 4, 1901.

inches for the harder woods. The amount of wooden paving in that city is somewhat over one and one-half million square yards. The woods used have about the following relative wear: 1, teak; 2, karri; 3, pitch pine; 4, native pines. The last are generally used. The traffic on the principal streets is enormous. On the Rue de Rivoli, it is over 65,000 teams per day, or 3,400 per yard of width, and over 66,000 teams per day on the Avenue de la Opera, or about 2,000 per yard of width. Fifth avenue, as counted for the Barber Asphalt Company some few years ago, showed 8,400 teams per day, and Madison avenue 7,000, about one-eighth of the Paris traffic. Under this traffic the native woods wear on the average 1 centimeter or 0.4 inch per year, and are allowed to wear down until 10 centimeters of the total depth of 15 centimetres have been worn off. They are then removed. This gives under the heaviest traffic in the world, with inferior woods, a life of ten years. The horses are not allowed to have calks on their shoes, which probably makes the wear a little less severe than in this country, but this is counterbalanced many times by the enormously greater volume of the traffic. On the other hand, the absence of the calks proves that the pavements are not slippery, an argument which is sometimes advanced against wood pavement.

It may possibly be said that the wear above noted per year is considerable, although taken in connection with the volume of traffic this is not so. In Paris it is found that the rate of wear under the heaviest traffic, for wood, namely, 1 centimeter per year, is exactly the same as the rate of wear for granite throughout the entire city.

CONSTRUCTION OF THE PARISIAN STREETS

In constructing the streets in Paris, the concrete is brought to a true surface by floating it with a grout composed of Portland cement and fine sand. No sand cushion is used. The blocks are laid directly on the smooth concrete surface, and are laid perpendicular to the line of the curb. Laths, afterwards removed, are introduced between the blocks, making a joint of about 3/8 inch, which is grouted with sand and Portland cement. About twelve days suffice to complete any particular portion of a street, from the date of closing it to the date of opening it again to traffic.

Owing to the fact that soft woods are generally used in Paris, the surface of the wood is to some extent spongy, and the practice of spreading a thin layer of sand and fine gravel over the streets every few days is followed, the gravel being crushed and ground into the fiber of the wood, giving the roadway a sandy surface. This, of course, reduces the slipperiness of the pavement. In London, however, this is not frequently done.

Labor employed by the Paris city authorities costs from 80 to 90 cents per day, and the completed pavements cost for wood about \$3.10, for granite about \$3.40, and for asphalt about \$3.12.

A large proportion of the woods used in Paris are treated, creosote being generally employed, but a large quantity of the preservative is not used, generally from eight to ten pounds per cubic foot.

MILLIONS OF SQUARE YARDS LAID IN LONDON

In London there was laid from 1874 to 1884 about one million square yards of wood. There is now about four times as much in that city. The earlier pavements were untreated wood, generally Swedish deal, a wood of fairly good quality. Later it was "pickled," as they call it, by dipping in hot creosote oil after thorough seasoning. About ten years ago the Australian woods, karri and jarrah, came into favor, but are not now generally regarded as being so satisfactory as creosoted deal, and pavements laid with them are being taken up and replaced with creosoted Swedish deal. Most of the pavements now being laid consist of Swedish deal on concrete, either creosoted under pressure, or dipped, although untreated wood is used in some sections. The Swedish deal used in London weighs from 3,500 to 3,600 pounds per thousand feet B. M., while our best long-leaf Georgia pine weighs about 900 or 1,000 pounds more per thousand feet, or 4,500 pounds per thousand feet. It is therefore a much harder and more durable wood, having a crushing resistance along the line of the grain greater than that of oak.

Wood on concrete has been used for paving in London for some twenty-seven years, its use having been begun about 1874, although the first London wooden pavements were laid in 1839. The average life, of course, depends upon the nature and volume of the traffic. In

the Kensington district, where they use principally creosoted Swedish yellow deal, the average life of the pavement throughout the district is shown by the following extract from the forty-fourth annual report of the Surveyor of the Parish of St. Mary Abbots, Kensington, for 1900:

"Kensington High street was paved with dipped blocks laid by the Improved Wood Paving Company, in November, 1891, under their maintenance contract, which was then expiring. These dipped blocks had, therefore, lasted a little under eight years. The wood creosoted under pressure had lasted in the other roads about twelve years, with the exception of the section of Kensington road marked (c), which had been down nine and one-half years. The wood was not worn out, but it had been very much cut up and damaged by the operation of the National Telephone Company, and as the consequent reparation would have involved the making good of a considerable proportion of the entire area, it was deemed advisable to re-pave the whole surface and thus prevent the necessity of twice interfering with the traffic on this important road."

WEARING QUALITY VERY GREAT

It should always be borne in mind that figures for wear are entirely relative. The traffic over the streets in London is very heavy, far heavier than on the streets of any of our largest cities, and the constant and very heavy omnibus traffic is particularly damaging to the pavements. Therefore, the same class of street pavement in this country would, beyond question, have a much longer life. If further, we can lay a class of timber much harder and better able to resist wear than the Swedish deal, and add to this a treatment that will make the wood still harder and completely waterproof, we should, under lighter traffic, at least succeed in obtaining double the life obtained on the heavily traveled streets of London, or, say, twenty-four years.

A section of long-leaf Georgia pine, known abroad as pitch pine, 756 square yards in area, was laid with cement joints on King's road, London, some years ago. On the same road were laid sections of plain and creosoted deal, about the same time. The annual wear in the case of the plain deal averaged in depth during five years 0.139 inch, as against 0.055 of an inch for the pitch (Georgia) pine, or about two and one-half times as great. In the case of the creosoted deal on the same street, the average depth of wear was 0.111, or about twice that of the pitch pine. The results of the trial of pitch pine, as summarized in a paper read before the Institute of Civil Engineers in 1883, were to the effect that "practically the plain pitch pavement is cheaper than yellow deal, and the ascertained vertical wear promises admirable results." The use of yellow pine, however, in London, in spite of this opinion, has not extended because of the great cost of the best qualities of lumber delivered there.

The dimensions of the blocks used in London are almost invariably three by nine inches on the wearing surface, and four to five inches in depth. The blocks are often worn in some places to little more than an inch in depth before being removed. Such excessive wear would only be secured in the case of pitch pine, in a period approximately two and one-half times as great as that required for equal wear with the Swedish deal.

GUARANTEE FOR MAINTENANCE

With regard to a guarantee for maintenance, the conditions of contract vary in every district. In some districts the authorities employ their own labor, and in such cases the timber merchant simply supplies the blocks under the inspection of the surveyor of the district, and their liability ends with the delivery of the blocks. In other districts where the work is contracted for in its entirety, the contractor has to supply and lay the wood paving to the satisfaction of the surveyor, and his liability ends as soon as the work is completed. In other districts the practice is for the contractor to keep the roadway in perfect condition for a given period, varying from six months to three or more years, either free or at a price per year included in the original bid. Prices thus vary considerably. Throughout the district of Kensington, 43,476 square yards of pavement, laid during the year ending March, 1900, all creosoted deal, part four and part five inches in depth, cost an average price of about \$2.25 per square yard. This embraces no cost for maintenance.

With reference to creosoted blocks, the report of Mr. Weaver,

Surveyor, Kensington District, says: "The superiority of creosoted blocks over plain wood is demonstrated by the fact that creosoted 5-inch blocks in High street, Notting Hill, and Fulham road lasted twelve years, whereas the previous paving, consisting of 6-inch plain deal blocks, lasted less than nine years under much lighter traffic."

SAND USED TO PREVENT SLIPPING

Wooden pavements abroad are often sprinkled with sand, as before mentioned, to reduce the tendency to slip. Soft wood blocks, especially those creosoted, have a rather slimy surface, making them probably more slippery when wet than harder blocks having a surface unaffected by moisture. Also there are no calks on the horses' shoes, which renders such sprinkling more necessary. It is an advantage that wood pavements may be so sprinkled and slipping thereby reduced. Asphalt, more slippery than wood in the start, cannot be so sprinkled without injury to its surface.

It has been claimed, against the use of wooden blocks, particularly when untreated, that some of the blocks are softer than others and more porous, and consequently will wear more quickly; but this is remedied by the treatment of the block, especially where the mixture of creosote and rosin, called the creo-resinate process, is adopted, owing to the fact that the softer and more porous blocks take up that much more of the preservative and hardening mixture, and are therefore all brought to the same degree of resistance. At the same time, where only heart wood is used, with no sap whatever, the difference in density of the wood is very small.

THE IDEAL WOOD PAVEMENT

Earlier in this paper the writer has referred to what he considers the ideal wooden pavement. In his opinion this should be about as follows: The concrete foundation—preferably, although not necessarily, of Portland cement—need not be included, as that or its equivalent is a necessity for all permanent pavements. Suffice it to say that its thickness should be in keeping with the traffic over the street and the nature of the sub-grade.

In constructing a perfect wooden pavement, two methods of treating the surface of the concrete may be adopted. It may either be covered with a very thin cushion of clean fine sand, not exceeding one inch in thickness, and thinner if the upper surface of the concrete will admit of it, or it may be floated with a grout of Portland cement and fine sand, mixed thick and brought to a true surface and grade by the use of a template, as in the case of a sand cushion. If the latter method is used, the blocks may either be set in the wet surface of the grout, and lightly tamped or rolled, or the grout may be allowed to harden and its surface be slushed with a coating of pitch or asphaltic cement, such as is often used in grouting joints with brick or granite block. Into this coating, while hot, the blocks should be set, and tamped or lightly rolled, as before. The blocks should be set as closely together as possible, both in the direction of the street and from curb to curb, and rammed tight every few courses. By laying the courses at an angle to the curb line, say thirty degrees, better results will be secured, as there is much less chance for the calks of horses' shoes to round off the edges of the blocks. After being laid the joints should be partially filled with very fine, clean sand, and the pavement rolled. A much heavier roller may be used with advantage where a sand cushion is used. The Boston pavements above referred to were mostly rolled with a 15-ton roller, and no damage whatever was done to the blocks. With bricks this would not have been the case. After rolling the joints should be fully filled with pitch or a good asphaltic cement, composed about

as follows, and used at a temperature of 300 degrees Fahr.: Twenty parts refined asphalt, three parts residuum oil and 100 parts coal tar, generally known at the works as No. 4. Such a grout should be poured over the entire surface of the street and be swept into the joints with a wire broom. The surface of the street, after grouting, should be spread with a coating of fine, sharp sand, making a practically perfect roadway.

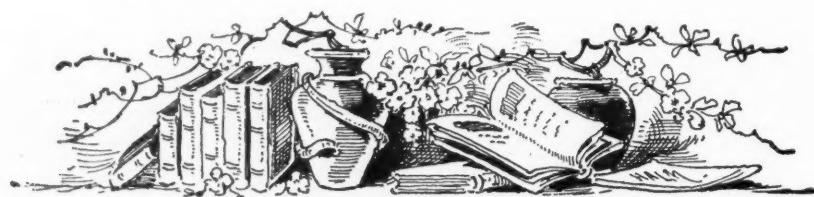
GEORGIA PINE THE BEST MATERIAL

As regards the character of the wood to be laid, much may be said. Softer pines, comparable to the deals used abroad, creosoted, will make a good and durable pavement, and the company manufacturing the creo-resinate block also manufactures ordinary creosoted block. But for the maximum of durability the heart long-leaf Georgia pine is the wood of all others. Such wood may be thoroughly creosoted, and under these conditions will not rot. But two points must be considered. Creosoting alone has a tendency to soften the fiber of wood, and its surface becomes spongy. It also, while not soluble in water, may be washed out by the action of water, and some of its constituent parts being volatile, may evaporate. The problem is, therefore, to retain the creosote oil absolutely in the wood, and to so harden the fibers of the wood and fill up its pores that it may become both waterproof and at the same time have an even greater resistance to wear. This may be successfully done by incorporating with the creosote oil used about 50 per cent. of melted rosin, the two forming a perfect mixture when hot, and forcing this compound into the timber under pressure until from twenty to twenty-two pounds per cubic foot has been driven in. Timber so treated weighs about 5,500 pounds per thousand feet board measure. Untreated pine of the same quality weighs 4,500 pounds; Swedish deal, as used abroad, 3,600 pounds. The blocks so treated are called creo-resinate blocks by the company making them, the United States Wood Preserving Company of New York. There are other steps in the process adopted by this company which need not be mentioned here, as for instance, the complete sterilization of the timber by bringing all its parts up to a temperature of 212 degrees, thereby destroying germ life in the heart of the wood.

BOSTON'S EXPERIENCE SATISFACTORY

In the first piece of pavement laid in Boston, that on Tremont street, under the continued action of the sun in very hot weather (there are no buildings on the side of Tremont street near the Common, and hence the pavement had no shade from noon until sunset), some of the creo-resinate material exuded from the joints, and was spread on the surface of blocks. The pavement was consequently treated with a solution of lime and water, which hardened and solidified the rosin and prevented further trouble on this score. Subsequent streets laid were grouted with paving pitch, or, as on Boylston street, cement grout, and this trouble has not again presented itself.

The question of expansion joints is one which apparently has been given no attention in the above specifications. As a matter of fact, wood is such a poor conductor of heat that expansion to any extent does not occur from this cause. If the wood absorbed moisture, it might swell or be affected by the frost, but being practically waterproof, it is not so affected. Hence the lack of necessity for expansion joints. This has been proven during the past severe winter and summer by the section of pavement on Tremont street.



THE TRUTH ABOUT THE TOLEDO NATURAL GAS PLANT

Not a Failure of Municipal Ownership But of Government—The Mayor is No Wise Responsible—The City Had No Right to Enter Into Competition with Private Companies—Real Causes of Failure

Samuel M. Jones*

SOME of the newspapers of the country have made much ado over the fact that the city of Toledo has recently leased its natural gas plant to a private corporation, and the circumstances has been referred to as a final and complete proof of "the failure of municipal ownership." As I view the facts, there is nothing upon which to base this claim; the only failure that can be proven by the history of the plant is that, not municipal ownership but municipal government is a failure. This is not my claim, but it must be the only logical conclusion of those who seek to prove that municipal ownership is a failure through citing the history of the Toledo Natural Gas Plant.

STARTED TWELVE YEARS AGO

This enterprise was started about twelve years ago, some four years before I became a resident of the city. Before taking steps to enter into the natural gas business, the city had granted two franchises to two private corporations, giving them the right to lay pipes and establish a natural gas plant within the limits of the city. In view of the fact that the city had done this, I hold that it was both a mistake and an injustice on the part of the city towards the private corporations, to whom it had granted the franchises, for the city to enter into the natural gas business. In granting a franchise to a private corporation to carry on a certain line of business involving the use of streets and alleys such as the street railway, telephones, telegraph, gas or water, the city in effect enters into partnership with such a private corporation.

This class of service is what is known as a "municipal monopoly," which means that the ownership and operation of a street railway is a kind of business that separate owners cannot sensibly or profitably engage in on the same street at the same time; and, to a certain extent, the use of the streets for gas, telephone lines, etc., is of the same character, therefore, the city becomes, in a certain sense, a partner with any corporation to whom it grants these privileges; and when a city has once granted these privileges, it is in effect a violation of contract, and an immorality as well, for a city to enter into competition with such a corporation, for, practically, it is going into competition with itself. The proper recourse and remedy for a city, so long as franchises are granted, is to safeguard the people's interests when the bargain is made, and then there is no other honorable way than to carry out the terms of the contract.

Thus, the city may regulate the price at which gas and light may be sold, the price that shall be charged as street railway fares, etc. This was the position of the city of Toledo with respect to the gas business at the time it entered into the construction of a natural gas plant and authorized the investment of double capitalization, the employment of a double set of men, and, in fact, a complete duplicate system throughout, involving enormous financial waste, every dollar of which must, in the end, be paid by the people.

BESET WITH MANY DIFFICULTIES

However, the main difficulties that beset the city in the attempt to conduct a private business are those that arise from the fact that a public corporation, a city, is made the subject of innumerable hindrances and restrictions in the name of law that put the city's agents at a great disadvantage in attempting to compete with the agents of a private corporation, who are free men. Notwithstanding all these hindrances, however, the natural gas trustees got along very well while the supply of natural gas in the northern Ohio field lasted, but the supply becoming practically exhausted, the city, on account of the slavery of law to which the city officials are subjected, was placed at a disadvantage that rendered the city helpless, and their plant a useless piece of property on their hands; whereas, on the contrary, the managers of the private corporation, having the liberty of free men, did the rational, the business-like thing—they extended their lines to the southern Ohio field, where for the last ten years

there has been a supply of gas that so far has proved inexhaustible. This gas is now marketed in this city by a private corporation for thirty cents per thousand cubic feet, and is used for both heat and light with perfect satisfaction.

So far I have not been able to find a gas engineer in the country who would attempt to claim that a gas of anything like equal value with natural gas can be manufactured and retailed at thirty cents. This fact practically shut the city out from finding relief in the erection of a plant for the manufacture of gas. These conditions are what led the Common Council to conclude to lease the plant to the Toledo Gas, Light and Coke Company, a concern, it is true, depending entirely upon the manufactured gas, but it is a "going concern," and has business that has been established for many years, with a large list of customers, and by resorting to the economies of recent discovery, both in the manufacture and use of gas, this company is able to continue its business and expects to enlarge it by using the city's lines.

REAL REASONS FOR ITS FAILURE

The story that is circulated, to the effect that this municipal enterprise was "inaugurated and carried out to failure by Golden Rule Jones," is of a kind with the arguments used by the enemies of public or common ownership generally. It is a lie, pure and simple, as I lived in Lima, seventy miles away, and was not a resident of Toledo until nearly four years after the gas plant was started. The Toledo natural gas plant, then, has failed as a municipal enterprise for the following reasons:

First. Because it was an immoral and unbusiness-like proposition for the city to enter into this business after having granted franchises to two private corporations to carry it on.

Second. Because the supply of natural gas in the northern Ohio field gave out. Had the supply of natural gas been like the supply of manufactured gas, or like the supply of water which we are drawing from the river, our natural gas plant would have been as complete a success as our water works plant, a property of which the people are justly proud and one they would not, under any circumstances, think of turning over to a private corporation to be run for private profit, because it renders a more satisfactory service at less cost than any private corporation would render.

Third. Because of the hindrances and limitations that city officials are subjected to in the name of "law," which place those who are charged with the management of city property at a disadvantage with managers of private corporations. This is not because the plans have been laid by the corporations to get the advantage of the people; it is because of the fact that the people have voluntarily hampered themselves; because we are yet lacking in an ideal that involves social success.

In short, because our laws have naturally been framed in the interest of the individual and against the interest of collective society, and this is fundamentally the reason why the Toledo natural gas plant failed. And I repeat, that it in no sense proves the failure of municipal ownership, but it does prove the failure of municipal government. Some day, when our ideal shall have enlarged, and instead of thinking of success as something that means a rich man, we shall think of a city full of healthy, ablebodied fathers and mothers and happy, joyous children. Then, we shall work together for the good of all rather than to pursue a mistaken policy of seeking the good of one individual through the exploitation or plunder of the rest. Then, every species of property that is socially produced will be socially owned. Then the good of the whole community will be our chief concern, and gas, water, street railways, light, telephone, telegraph and every species of public necessity will be administered in the interest of the people, and the service rendered at actual cost, for we shall realize that the business of life is the building of a nation rather than the making of a few individuals rich.

* Mayor of Toledo.

A MODERN MUNICIPAL CONDUIT

Nearly Completed in Baltimore—The Engineer in Charge Tells the Story—General Design and Methods of Construction—Careful Plans for Operation of Utmost Importance

By Charles E. Phelps, C. E.*

THE city of Baltimore has been remarkably conservative in the matter of internal public improvements, and visitors have frequently remarked the absence of proper sewerage methods, the generally poor condition of street paving, and the hideous unsightliness of the important thoroughfares of the city from the numerous poles and overhead wires which encumber them. Even more, the citizen was continually impressed with the ever present danger to human life from these overhead wires; numerous persons not identified with the electrical art having lost their lives by reason of the unsafe conditions.

While the necessity for other public improvements was generally felt and understood, yet the removal of these dangerous wires was



SOUTH HEADING AND DRIFT, ELEVEN FEET DEEP

publicly aired and agitated during the past decade. The only conduits existing in the city during this time was built by the local telephone company in 1889 and 1890, but they did not materially influence the overhead situation.

COMPANIES OPPOSE MOVEMENT TO PUT WIRES UNDERGROUND

No motion being made by the local wire using companies to go underground, this agitation took the form of a proposition for the city to construct and own all conduits thereafter to be built, requiring all wires and poles—excepting trolley wires, but including feeders—to be removed within a certain section of the city and placed in the city conduits, the city to receive a certain annual rental for the use of the conduits.

Naturally, this proposition was not regarded favorably by the companies, and considerable opposition developed, but despite this opposition, the proposition successfully ran the gauntlet of constitutional and legal restrictions, and is being essentially followed at this writing.

The enabling act was passed by the State Legislature in 1892, receiving the approval of the City Council upon its final passage in 1898, in the meanwhile being submitted to popular vote and approved at the election of November, 1897, as required by constitutional provision.

In the interim, between 1892 and 1898, an ex-officio body, known as the Electrical Commission, and composed of the Mayor, City Register and President of the Board of Fire Commissioners was created, by ordinance, and provided with funds to investigate and report upon a feasible plan for constructing the system; this report, which is a valuable contribution to the literature upon the subject, was submitted in 1896.

* Chief Engineer, Baltimore, Md.

In the telephone conduits built in 1889-90 previously referred to, the city was reserved the free use of one duct in each line for the use of its police and fire alarm wires, and to make this duct available, it was necessary for the city to construct certain connecting lines of conduit. This was done under supervision of the Electrical Commission at a cost of \$225,000, and a large area of the city has had its fire alarm and police wires underground since 1896. This was the nucleus of the underground system now being completed in this city.

THE DESIGN AND CONSTRUCTION

Upon the approval of the ordinance creating the present Electrical Commission, similarly composed to that above referred to, the commission organized and the work of designing a general conduit system was entered upon. No detailed description of the design need be given here, it being a matter governed entirely by local conditions and the requirements of the companies interested, being within the scope of duties of the engineer in charge, who will of necessity make himself familiar with these local conditions.

Beyond these numerous details, which depend upon local physical characteristics, the chief question to be determined in designing a conduit system and one which has a decided influence upon economy in operation is the extent to which the system is to cover the territory selected. A "general" conduit system is one constructed for all classes of electrical service, telegraph, telephone, commercial electric light and power, street lighting, street railway supply and other and varied services which may in future develop. In view of experience, I would lay particular emphasis upon the question of completeness. There are more "compromise" than "comprehensive" conduit systems, with very little of the system. Many conduits are built for trunk lines only, with pole distribution, even in congested business sections, while some systems combine trunk and distributing conduits underground, making a "block" distribution by one or two underground connections into each block of buildings. These are what might be called "compromise" systems. A "comprehensive" system, on the other hand, should be considered as being composed of two distinct parts, trunk or main conduits for feeders; and

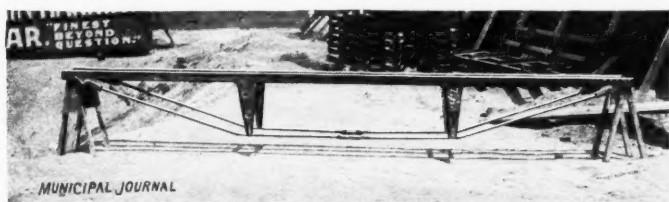


GUILFORD AVENUE BRIDGE, LOOKING SOUTH—TILE IN POSITION

distributing conduits for secondary mains off which service can be run directly into buildings underground.

No locality can consider the adoption of such a system unless its important sections for business or residence are more or less con-

gested, or, in other words, where the demand for service is sufficient to justify such construction. There are few, if any, large cities in this country where such a system for underground distribution is not only justified, but would not, were the conditions of operation close-



FORM OF TRUSS USED BY ELECTRIC COMMISSION FOR CARRYING CONDUITS OVER GUILFORD AVENUE BRIDGE

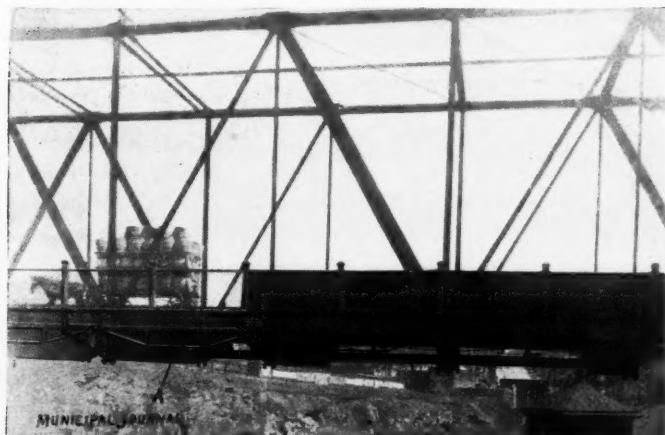
ly studied, prove to be superior in economy of operation to any other method requiring the maintenance of overhead conductors.

PERMANENCY AN ESSENTIAL REQUISITE

When the work of designing and constructing a general conduit system for Baltimore was entrusted to the writer, it was deemed of first importance to provide a system that would be permanent and thorough. By permanent is not only meant quality of construction, but a job of such character that the necessity for future connections and alterations within the prescribed underground district should be reasonably anticipated, and by "thorough" such a system that the "cutting in" of new services would not require the opening of streets.

To begin with, a familiar solution of the "underground" situation is to build only sufficient conduits to meet the popular demand for the removal of overhead conductors on congested lines, with no apparent consideration being given to the question of economy from the point of view of the operating company. Did it but stop to consider there is little doubt but that the final projected system would result in a considerable saving. As a community increases in population and business importance, as its thoroughfares for the transaction of business and for residence become more and more congested, there is an increased demand for the removal of poles and wires, which demand cannot be successfully resisted for long. It then becomes necessary for the operating company to provide for this further clearing away of poles and wires, which includes service connections into buildings, at a sacrifice of economy because of the necessary alterations, connections and enlargement.

It is here that the great expense of conduit construction is felt, and it is for this reason that the operating companies oppose any further move to put their wires entirely underground. The beneficial results from a complete undergrounding of conductors is lost in the piecemeal character of the construction. Only that work is done which is demanded at the moment, and instead of taking up the



GUILFORD AVENUE BRIDGE, SHOWING TRUSS IN POSITION

proposition consistently, upon details thoroughly planned and executed, a large construction gang is kept continually at work skipping from one remote section of the city to another, almost as much time being lost in moving from job to job as in the actual work of construction.

BENEFITED BY EXPERIENCE ELSEWHERE

We, in Baltimore, have endeavored to benefit from the experience of our brothers in other cities, and the work as planned for this city, and which is now nearing completion, contemplates the most complete conduit system which it is thought can be produced at this stage in the progress of operating conductors underground.

Our system comprises two essential constituent parts: First, the main or trunk conduits, which carry all feeders of whatever character. For electric light or power these main conduits connect with large underground vaults, known as "transformer manholes," in which are located transformers for feeding the distributing mains.

The distributing mains are laid so as to reach every house within the established underground district, the mains being laid on a uniform grade of about 28 inches and having directly in the line of service boxes to serve three houses on each side of the street, making six houses served from each box.

All conduits are constructed of material manufactured in Perth Amboy, N. J., by the American Vitrified Conduit Company, and are made in 4, 6 and 9 duct pieces 36 inches long. The main conduits vary from 18 ducts up to 82 ducts in capacity, while all princi-



DUCT CONDUIT AT MANHOLE, INCOMPLETE

pal distributing conduit is made up of 10 ducts with 6 ducts in tie lines.

Manholes have received special attention and are of large size, the smallest being 5 x 8 feet in area, ranging up to 6 x 14 feet for the largest lines.

"Junction boxes," which are comparable to the "catch boxes" in the "Edison tube system," between intersections and distributing lines, are 48 inches by 64 inches, and all service boxes are standard at 42 inches by 45 inches in street paving, built of brick, while for lines built in sidewalks they are made up in a circular vitrified tile box 36 inches in diameter, with opening cut for ducts and services.

IMPORTANT POINTS OF CONSTRUCTION

All manholes, junction and service boxes are floored with brick, and an illustration is shown of the typical manhole roof construction which has proven exceedingly rigid and cheap. The arch blocks are of especial design and made by the manufacturers of the vitrified conduit, as were also the tile service boxes.

The service connections into each house consist generally of four pipes; one 3 inches, two 2 inches and one of 1½ inches in diameter, and owing to the prevailing high price of iron pipe, which would have otherwise been used, these pipes are made of indurated wood fibre, encased in four inches of Portland cement concrete.

That section of the city for which house service connections are made, or where a "comprehensive" system is under construction, is one mile long by one-third of a mile wide, and embraces almost the entire business section of the city. About 3,000 separate buildings are included within this area, and more than one-half of these have, up to this time, been connected into the conduit system. When completed and in operation there will be no excuse for a single overhead wire within this area.

The general construction of conduits follows the well known standards, the only features being in details of operation. A general statement is always made in reference to conduit construction that the thickness of concrete around the conduits is to be three or four inches or more, as the case may be, composed of a certain brand or grade of cement, sand and stone. Neglecting the character of bed soil upon which the conduit is to rest, this mere statement does not convey an intelligent idea as to the durability or permanence of the finished conduit.

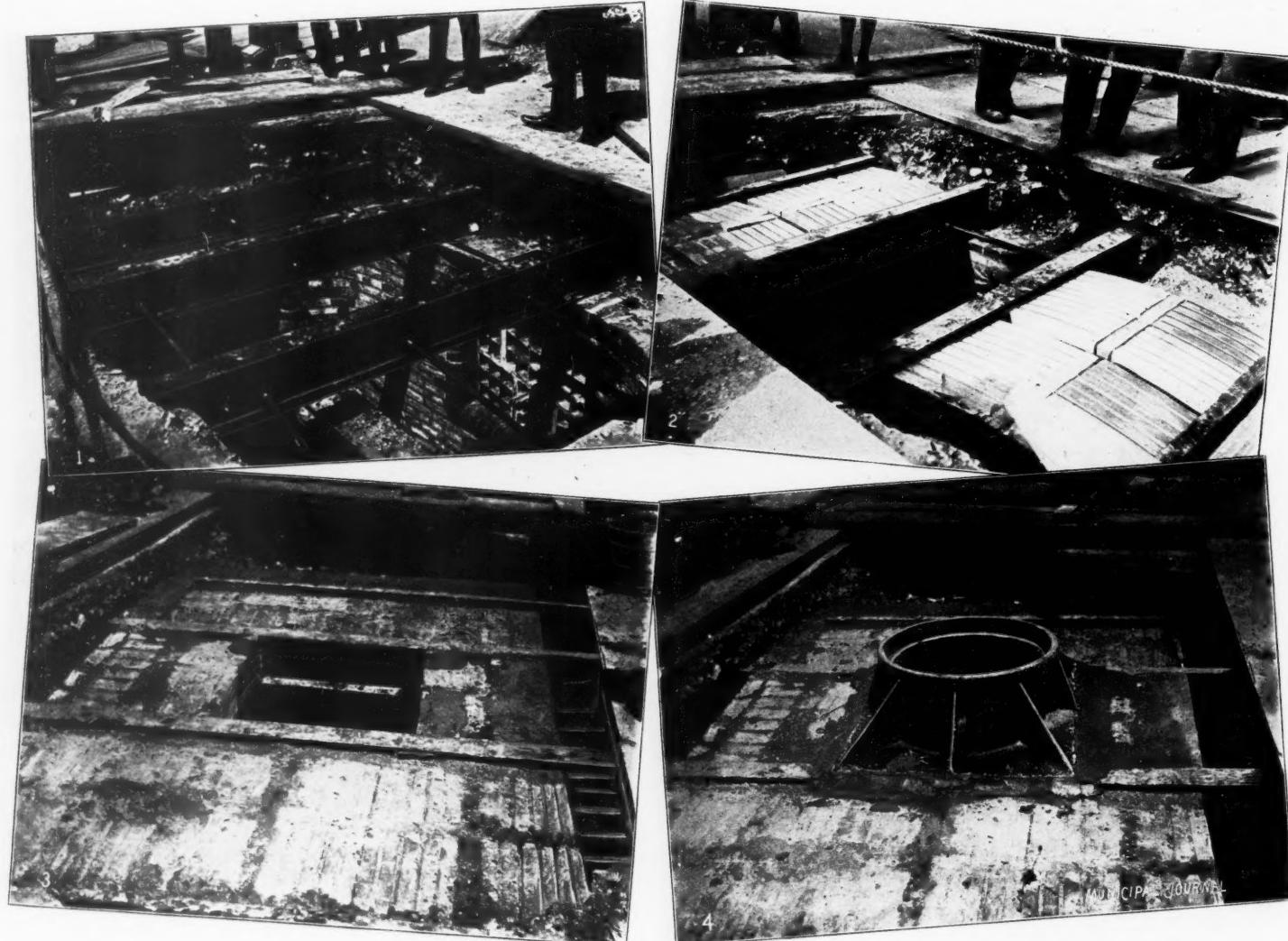
Beginning in the spring of 1899, we used hand mixed concrete composed of one Union Rosendale cement, two and one-half screened and washed sand and five broken gneiss rock. Careful records were kept of the performance of the actual concrete as tamped in place. Mixing by gravity in a machine constructed for the purpose developed a much better concrete at a less price than by hand mixing. A view of the gravity mixer as used is shown. Investigation along the

mixing the concrete. In the meanwhile the "dromedary" mixer was brought out by Fisher & Saxton, of Washington, and two were purchased and have been used on the work since last spring.

In the mixer the materials are placed in the proper proportions in a revolving barrel drawn by a horse, with the necessary amount of water added. The constituent materials are taken from a point sufficiently removed from the work to insure a complete mix, and are dumped into the ditch completely and thoroughly mixed, much more so than is possible in hand mixing, and with no loss of water and cement in the operation.

The result of comparative trials of hand mixed, gravity mixed and "Dromedary" mixed concretes are given to show the marked difference in costs by the various methods: The

"Dromedary" mixed is represented by.....	100
Gravity mixed is represented by.....	118
Hand (board)	155



I. MANHOLE CONSTRUCTION, I BEAMS IN PLACE. 2. MANHOLE ROOF CONSTRUCTION, ARCH BLOCKS PARTIALLY IN PLACE. 3. MANHOLE ROOF CONSTRUCTION, ARCH COMPLETED. 4. MANHOLE ROOF CONSTRUCTION, FRAME CASTING SET

line of machine mixing greatly improved the resultant mixture, and also reduced the cost per cubic yard.

MACHINE CONCRETE MIXER PREFERRED

It should be remembered that in conduit construction the centre of the work is continually changing, making it more difficult to adopt economical methods than where work is stationary. In our adoption of machine mixing it was necessary to provide points for setting up the machine and means for quickly conveying the material to the ditch. This was effected by the use of a Hunt portable railway and dump cars, the concrete being dumped directly from the mixer into the cars and thence into the ditch. We made many experiments tending to consolidate the labor of mixing and moving cars so as to save one handling of the mixture, or, in other words, mixing in transit; to cause the labor of handling material to constitute a factor in

while the actual efficiency of the mix is increased by machine mixing. So much is said of the concrete in construction because of its important relation to the permanence and durability of the finished work. There is no intention of posing as an advertising medium for any particular concrete mixer, but in the construction of a conduit system necessarily embracing a large amount of detail, it would be remarkable indeed had we not hit upon something good to give to the profession, and the purpose of this article is not to tell what is already generally well known, but to endeavor to point out whatever may be of interest to others, who doubtless also have many wrinkles of which we should be glad to hear.

CONCRETE WORK AN IMPORTANT ELEMENT

Good concrete is one of the essentials in concrete construction, but even with first class concrete one is often at wits end to keep sewer

and illuminating gas and water out of the conduits and manholes. I do not believe it is going too far to say that no amount of concrete will render a conduit system entirely free from water and gas, that is, with an amount of concrete consistent with cost and accommodations



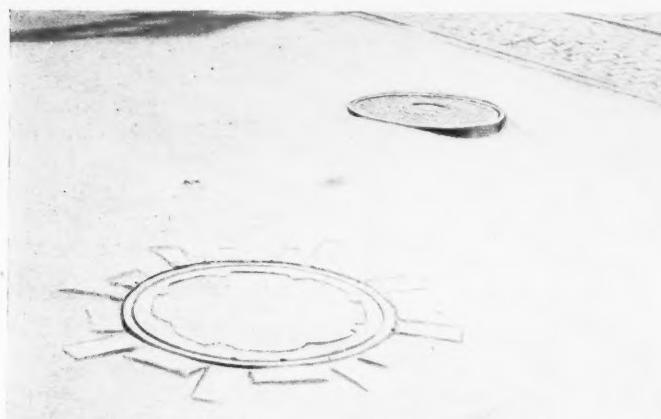
DROMEDARY CONCRETE MIXER LOADING

in the streets. Some of the conduit lines, and many of the manholes in Baltimore have their levels below tide water, and thus are subjected to a heavy pressure from that cause. All parts of the system are within the sphere of influence of the wretched drain pipes which have been laid in the streets from time immemorial by private property owners, made necessary by existing sewerage methods, which would disgrace a town of the one-hundredth part of the population of Baltimore. Many of these drains, especially in the business section of the city are exposed to increased pressure from elevator discharges, and are consequently liable to burst at any moment, and at any point. The streets are full of these "maverick" drains of inferior terra cotta material, varying anywhere from one to twenty-four inches in diameter. The amount of water which will appear in a deep ditch on a dry day in Baltimore would be inexplicable to one not previously posted.

During construction this ground water is taken care of by underdraining; in cases where leaking drains are the cause, a permanent drain of porous tile is laid with open joints under the conduit line; in other cases a temporary drainage of the ditch is effected by filling the sub-grade for four or five inches in depth with broken terra cotta, stone, etc., the concrete bed being laid directly thereon.

HOW MANHOLES ARE DRAINED

For drainage of manholes after completion, where storm water drains exist on the proper level, a direct connection is made. In the



MUNICIPAL JOURNAL

RELATIVE APPEARANCE OF AN ASPHALT FILLED COVER AND A SOLID IRON COVER

majority of cases, however, there are no outlets available on proper levels, in which case the leakage water is raised by means of water syphons, using water pressure from city supply mains. In all manholes the drainage connection leads from a sump hole beneath the

manhole floor, and all drains are tapped and provided with back pressure valves. In some manholes on high ground where the soil is sufficiently porous, it has been found possible to drain by natural means, by what we term a "dry sump." This consists of a hole driven down through the manhole floor by an earth auger, well into the bed of the porous soil, sand or gravel, which usually appears upon a bed of clay. In such cases where a good depth of sand or gravel is met, the water will drain off rapidly and thoroughly.

Due to lack of sewers and sewer manholes there is consequently no sewer gas of any amount, but the leakage of illuminating gas from the distributing and service pipes throughout the city make up for this deficiency.

Here again neither the amount nor quality of concrete around the conduit has sufficient bearing upon the collection of gas in the system to be interesting. We have proven by experiment that the dangerous constituents of illuminating gas such as is used in Baltimore, made by the water oil process, free hydrogen and carbon monoxide will pass with the greatest facility and ease through concrete masonry, many times thicker than it is practicable to use in conduit construction.

Such being an established fact familiar to all who construct or operate underground systems, and the presence of these gases in manholes being recognized as an element of danger to those whose duty it is to enter and work in manholes, and also to the liability of damage to the structure from possible explosions of the mixture, it there-



EXCAVATION FOR MANHOLE—GAS AND WATER PIPE OBSTRUCTION

fore becomes encumbent upon the owner of the conduits to provide against these dangers.

VENTILATION OF MANHOLES STILL AN OPEN QUESTION

No satisfactory method of ventilating manholes by artificial means has yet been devised which may be operated and maintained at a cost within the means of an average owner, and recourse must be had to ventilation by natural means.

There are generally two methods of applying the principles of natural ventilation to manholes, both of which are to a degree satisfactory, but neither can be said to be absolutely preventive.

In the case of manholes closed with an inner water and air tight cover, ventilation is best secured by two vent pipes, one leading from the top, the other from the bottom of the manhole, and brought to a height above the street surface which is best determined by actual trial.

When the inner cover is dispensed with, excellent ventilation is secured by perforations in the manhole cover, the number and size of such perforations being also determined by actual trial.

Manholes so ventilated in Baltimore have in some cases given satisfactory results with $8 \frac{1}{2}$ inch holes in the manhole cover, or approximately 8 square inches, while in other cases, where gas leakage is particularly heavy, a much larger effective opening is required. In the latter case the cover is perforated by $132 \frac{1}{8}$ inch holes, an effective opening of 130 square inches.

Such ventilation, under ordinary conditions, will generally dilute the gas in the manholes to such an extent as to be not harmful to workmen in the holes, and also to largely obviate the danger of explosions.

Under conditions of large gas leakage it is questionable if any method of ventilation will absolutely render the atmosphere in the manhole innocuous to workmen or to an explosion if the combination is present; *i. e.*, proper mixture of gas and air, and the flame to ignite it, but it is proven to our satisfaction that conditions harmful to both life and property may be almost entirely prevented by the natural ventilation above outlined.

SMOOTHNESS DUCT SURFACES NECESSARY

Another thing which is important from an operating standpoint is absolute surety in having the annular surfaces of all ducts in the system perfectly smooth and free from any protuberances which would be liable to injure cables in drawing them into the ducts. Our method in Baltimore is to draw through each duct as soon as practicable after completion, a steel brush made from a four-inch circular flue cleaner, ground down to a diameter about equal to that of the duct. This in reality answers two purposes, both of great value in ascertaining the physical conditions of the ducts. First, it cleans the ducts of all protruding substances which may have gotten into them during or after construction, especially flakes of cement mortar; and, second, it "proves" the alignment of the conduit, for the brush would not pass a joint which would offer obstruction to a cable being drawn in. Our confidence in this method is so great that when a conduit has been so rodded and pronounced "O. K." we feel perfectly sat-

isfied that it is in condition for any size cable which would pass through any tube of equal diameter and length. After having had cables pulled into about every line of conduit thus far built without the slightest injury, cables of the smallest size up to 1,500,000 C. M., electric light, and 200 pair of telephone, approximately within $\frac{3}{8}$ -inch of the full diameter of the ducts, our experience with this method may be said to have been eminently satisfactory. In addition to this method every part of the conduit material has been thoroughly inspected, and material which is in such a condition that a smooth annular surface cannot be assured is rejected.

CONCLUSIONS

To sum up briefly the "moral"—if I might so state it—of this article. I would first of all emphasize the great importance of "comprehensiveness;" spend more money at the start, but judiciously, build the system permanently and completely—it will endure for generations—and in so doing keep the principal motive in view, reduced maintenance charges and more effective service. As far as practicable plan for service connections into buildings, directly from the underground system, and so construct them that the money otherwise wasted on a large "service" gang will be saved.

Have one eye on plans for construction and two eyes on plans for operation, and make the system large enough to save future generations from unnecessary worry.

FIRE-PROOFING METHODS FOR BUILDINGS

Part IV

Experience the Best Guide—Some of the Unknown Quantities—Instructive Examples—Value of Artificial Tests

By J. W. Howard, B. L., C. E.

In this series of articles I have tried to indicate sufficient types of fire-proofing to show the practical methods and possibilities of many systems. What would render one building secure against fire would not protect another. The location of a building in reference to others, the objects for which it is built, and the use to which it is put must be considered. The nature, quantity, arrangement and condition of the contents of a building affect the fire-resisting power of the building. It is well known that it is simply a degree of intensity of fire as to whether or not the fire-proofing and a building will be injured or entirely ruined. Therefore, if a building constructed for offices or other purposes, needing only furniture, should be filled with merchandise in case of a conflagration it would soon fail.

EXPERIENCE THE BEST GUIDE

The best guide is experience. Fires occur in fire-resisting or fire-proof buildings from combustible buildings near by or from the burning of furniture, fittings, or goods in the building itself. Another way of determining the strength, adaptability and fire-resisting qualities of existing or proposed materials is by scientific and expensive experiments, under conditions equivalent to or severer than an actual fire in a building.

We will first consider what actual fires in modern fire-proofed buildings teach. Careful records and tabulated statements from engineering and financial standpoints are made by the insurance companies, engineers, architects and builders, deduced from all fires which take place. Extra attention is given to those in fire-resisting buildings. The art has progressed so far that several systems of fire-proofing, when carefully and properly applied, will keep a building from total destruction and generally confine the fire to a few rooms or a few floors. The contents of such buildings, however, are often such that, in connection with the wood floors, doors, and fittings, they burn as fuel in a furnace.

Experience has shown that fire-proof construction must fulfill many requirements besides resisting fire. It must sustain its own weight, and that of the filling and floor upon it, and often the ceiling below. It must bear heavy loads of furniture, safes, merchandise, machinery when standing in position and moved from place to place. The build-

*NOTE.—This valuable series of articles, by our Engineering Editor, Mr. Howard, was commenced in July, and continued in August, October and November and is brought to a close in this number.

ing laws of cities differ as to the amount of superimposed load, or live load, which floors in different buildings for different purposes must sustain in addition to the weight of the materials of the floor and that which is permanently attached to it. New York requires for dwellings, hotels, etc., a strength to sustain at least sixty pounds of loose load per square foot over the entire floor; for offices, seventy-five pounds; schools, seventy-five; public halls, ninety; ordinary stores, 120; warehouses, factories, etc., 150, with special requirements for special cases. Fire-proof construction must resist shocks and jarring from moving or falling pieces of merchandise, machinery, etc. It must not suffer from slight irregular settlement which takes place in most buildings. It must not crack from expansion or contraction during and subsequent to construction.

The steel frames and other parts of buildings have different rates of expansion, with changes of temperature, than that of the brick, fire-clay, terracotta, concrete and other materials of fire-proofing. Sudden changes of weather, especially in winter, affect warehouses and even large office and other buildings. In the latter case the heated interior of the buildings with thin exterior walls and extreme cold outside affect the fire-proofing if not properly constructed. Cracks permit flames to gain access to the steel frame to its injury in case of fire.

The access of air containing moisture to the air spacing and otherwise under and about the fire-proofing, steel frame, and especially the small metal parts of the frame, may cause slow but sure disintegration of poor bricks, poor mortar, ill-chosen concrete, plaster and poor paint on the metal. Slow oxidation by rust will attack the steel and iron.

SOME OF THE UNKNOWN QUANTITIES

The questions of rust and slow destruction of some of the many pieces of steel in modern buildings must sooner or later demand the attention of the best minds. At present, because modern steel frame buildings will outlast two or more generations, it is not to the advantage of the present owners or builders to dwell upon and thoroughly investigate this question. The policy seems to be to leave rust to a future generation which experience will compel it to recognize, and, if possible, to remedy. It is a well known scientific principle that oxidation of iron takes place where we have a combination of air, moisture, carbonic acid gas, elements which are always present

especially in cities, in contact with iron. The destruction goes on even faster when some form of sulphur is present, as is often the case from the smoke of coal. It often happens that the ashes used in filling the floors of buildings in or upon the fire-proofing contains free sulphuric acid, sufficient to facilitate rusting.

The supreme test of fire-proofing is when a fire occurs. It must then keep the heat from the steel long enough for help to arrive. A fire in a building generally develops a temperature of 1,800 degrees F. to 2,000 degrees. When we remember how quickly structural steel when heated loses its strength we see why fire-proofing often fails. Steel loses one-tenth of its strength at about 600 degrees heat; one-half at 800 degrees and three-fourths at 1,200 degrees. Thus an ordinary fire, unless kept from a column, girder or beam, will quickly heat them to a temperature at which they can sustain only $\frac{1}{4}$ of the load they were designed to bear. Besides, weakness from bending when heated, expansion and consequent distortion of other parts of a structure, sometimes occur.

Fire-proofing material must be of such quality and so attached to the steel frames as not to crack, erode or give way under the strong impact of a modern fire stream of water, which attacks it not only by force, but also by the effect of sudden cooling.

Actual fires have proven that the usual building stones, granite, limestone, marble and sandstone soon give way before flames. It is conceded that, in general, the following materials resist fire when used to protect buildings with decreasing power in the order named: Cinder-concrete, porous terracotta, dense terracotta, hard brick, soft brick, plaster of paris. Terracotta, when manufactured, is subjected to a little above 2,000 degrees temperature. The materials of a good fire-proof concrete are Portland cement, 1 part, by volume; clean sharp sand, 2 parts; clean hard coal cinders or equivalent slag, 5 parts, mixed with about 1 $\frac{1}{3}$ parts of fresh water. Portland cement is manufactured at about 2,800 degrees. Sand is not affected at 2,500 degrees, and the ashes have passed through at least 2,400 degrees. Therefore they can sustain separately or together 2,000 degrees of heat of a fire in a building. Experience and severe tests have shown that concrete will sustain greater loads, resist more heat and not be impaired or cracked by sudden cooling or impact of water as quickly as bricks, tiles and most other substances as used in fire-proof construction.

INSTRUCTIVE EXAMPLES

A few examples of actual fires in modern buildings are instructive. On October 13, 1892, the nine-story steel frame building of the Athletic Club, Chicago, was erected with the fire-proofing in position. The carpenters were putting in the wood doors, floors, etc. Lumber, barrels and rubbish of construction were still in the building. A fire destroyed every combustible. The fire-proofing was so injured as to require repair and replacing in almost every floor. The iron frame, however, remained sound. Only a few new pieces were needed. This fire showed the danger of having the doors, windows and shafts all open, and that a fierce, short fire can destroy fire-proofing, but that in so doing it may be kept from the steel frame of the building.

On April 2, 1893, the ten-story steel frame building, Temple Court, New York, became an example of how furniture and fittings of a building can be completely destroyed without serious damage to the building, but with great loss to the many tenants in valuable papers. This building was in the financial center of New York City.

The Manhattan Bank Building, supposed to be fire-proof, had its seventh and eighth floors give way by fire, and the contents of all the lower floors destroyed. The columns and other metal parts were not completely covered with the fire-proof tiles, with the result that the steel, when heated, soon gave way.

The Pittsburg fire of May 3, 1897, attracted the attention, not only of insurance companies, but of scientific men and the public, at home and abroad. It was a case where modern buildings, fire-proofed upon three systems, were subjected to conditions of heat and flame larger and greater than any thus far known in connection with modern fire-proofed steel frame buildings. The fire started at night in a wholesale grocery full of boxes, barrels of oil, lard and other excellent fire food. The flames crossed Penn avenue, entered the windows of three modern fire-proof buildings and completely cleared out the contents of two of them, and part of the contents of the

third. The buildings were the Horn store building, the Horn office building and the Methodist Book building.

The Horn store building was almost ruined. A large water tank fell from the roof through all the floors. It is an example of how steel beams give way under a heavy load when heated. This building had on one side two stairways and four elevator shafts, and in its center a light area, or opening, through all the floors. The flames consumed the dry goods, furniture and everything in this department store. The fire-proofing was dense, hollow tile, side construction, described in the June issue. It fell especially from under the girders and beams, resulting in great damage to the building to about two-thirds of its value. Before rebuilding a large part of the steel frame had to be replaced. The method of fastening the tiles with iron straps was a failure. The engineer experts who examined the structure before rebuilding stated that it would have been better to have employed concrete, especially about the columns and posts.

The Horn Office Building nearby was badly damaged, and its contents consumed. The fire-proofing was porous tile of end-construction, described in the June issue. The elevator and stair shafts were covered with hollow tiles. The water, gas and electric conduits were not encased in fire-proofing and were destroyed. Because wooden strips were inserted in many walls to which to attach door frames, baseboards, etc., great damage resulted to the partitions. About one-half the value of the building was lost, in addition to the entire contents. The intense heat was helped by some defective work, iron columns not being covered between the ceilings and floors above, so that when ceilings fell the columns were heated and weakened. Another defect of this and a previous building was the lack of iron, or equivalent, shutters on the outside of the building which would have excluded fire from the outside or confined it to one or two floors.

The Methodist Book building, across the street, in another direction from the origin of the fire, was partly damaged and its contents partly burned. Its floors were of monolithic concrete construction, shown in Figures 17 and 18 of August issue. The partitions were unfortunately made with wood uprights, or studding, covered on both sides with metal web lathing. And, therefore, where exposed for more than an hour to flames, gave way. Iron studding should have been used. The floors stood very well, except a few panels, which, through general contraction of the steel floor members or from original construction, were found, on examination after the fire, to sag a little. The concrete was composed of Portland cement, 1 part; sand, 3½ parts; slag, 6 parts.

The Chaffey building, New York, June 26, 1898, had a fire in several rooms for about two hours before discovery. Silver coins were found melted, indicating at least 1,750 degrees of heat, and brass was melted, indicating about 1,900 degrees of heat. The fire was confined to the fifth floor. When extinguished no damage was done to any other floor. The method was of the type indicated by Figures 20 and 21 of the August issue. In most instances in modern well fire-proofed buildings, where assistance can arrive within half an hour or less, the damage is confined to the room or floor of origin.

ARTIFICIAL TESTS

Artificial tests of fire-proof materials and methods of construction are constantly being made under official and scientific observation in structures made expressly for the purpose in the large cities of America and Europe. It is necessary to have these tests conform approximately to the actual size, quality and method used in constructing the walls, partitions and other parts of buildings. This is usually done by building a structure inclosing steel frames and having its roof made with the fire-proof materials, placed the same as in buildings. Partitions can also be inserted. The size of this test structure should be at least 15 feet square and 12 or more feet high. It should have openings at two or more places with chimneys to create draft. There should be openings below for air to pass under the grates, over the entire lower portion. A second grate is often needed above the first grate so as to obtain the intense heat needed. For ordinary tests the burning of three cords of dry oak wood in two hours is sufficient. A stream of water, under about sixty pounds pressure, should be suddenly thrown through the lower openings in the structure up and against the lower side of the heated experimental fire-proofed floor, which in these structures is the roof. The New York tests are for five hours, the last three hours burning to main-

tain a temperature of 2,000 degrees and then suddenly cool and extinguish the water under pressure. The temperatures are measured by any good pyrometer, or by the fusing of different metals, inserted for the purpose. These tests must be made by scientific men who carefully record every condition, occurrence and result.

It is pleasing to note that fire-proof wood was used throughout Hotel Martinique, New York, which, in addition to the approved fire-proofing of the steel frame and other parts of the building, results in a decided advance. Fire-proof wood has been long discussed and used on vessels and to a limited extent for shelving and a few fittings of buildings. But now that its cost is but little more than ordinary wood, it is to be hoped that its use will be widely extended. There

are several systems of fire-proof wood, giving competition and reasonable prices.

Metal furniture and fittings are now to be had, and are being more and more used with handsome art effects and practical results. This method of equipping modern offices and record rooms is indispensable to perfect safety from fire.

If we desire continued safety against fire in our warehouses, factories, other buildings and homes, we must, in addition to fire-proof construction, maintain constant, intelligent inspection of the nature, arrangement and condition of all that which these structures contain, the uses to which they are put, and that which exists in their neighborhood.

THE END

ACETYLENE GAS WIDELY USED AS AN ILLUMINANT

Rapid Development as an Industry—Particularly Adapted for Use in Cities, Towns and Villages—No Light Is Better Nor Safer

By Henry C. Earle, M. E.*

THE progress that acetylene gas, as an illuminant, has made in the last few years is no better shown than by the fact that at the Chicago fair in 1893, there was no exhibit of gas or the apparatus for making it, while in 1901 at the Pan-American Exhibition there is a special building devoted to showing the light with the generators and other articles connected with it. Here are shown search lights for yachts, and lamps for bicycles and automobiles as well as for the house. It is supposed that there are 40,000 acetylene generators in use in the United States, which are lighting stores, factories, churches, residences, and all manner of places, as well as some that are lighting whole villages or sections of cities.

BEST ARTIFICIAL LIGHT

This introduction into actual use has been made for the most part during the last four years, and against all the opposition of the powerful oil, gas, and electric light interests, and in spite of the poor machines that were often put out in the early stages of the business. The advance has been due directly and only to the good qualities of the light. In the best installations the claims made for acetylene by its friends are: It is the best artificial light in the world for general use; that it is a cheap light; that it is a safe light, and that it is a convenient light.

To enter more into detail into these claims, it may be stated that it is the best light because it is almost identical with daylight; a spectrum analysis shows the same proportion of the components, and no light is better than sun-light. As a result of this, colors are matched well as by no other artificial light, and photographs are taken.

AS SAFE AS ANY

In safety it is neither better nor worse than city gas, under like conditions; but it should be noticed that acetylene always gives a prompt warning of its presence by its peculiar odor, and as the regular burner will pass but $\frac{1}{2}$ foot of gas in an hour, it is not easy to get a large amount of gas into a room in this way. Also acetylene is never put in with lead pipes at the meter, as is city gas, and this source of disastrous fires is eliminated in the case of acetylene. Many very severe fires have been due to the escape of gas from the pipes that were burned off in the early stage of some fire, which otherwise would have been unimportant. The number of fires and fatal accidents from electric wires, places this latter means of lighting as one of the most dangerous; and on the whole acetylene, while it has often been said to be dangerous, is in many respects one of the safest methods of illumination.

AUTOMATIC GENERATORS

Of the present users of this modern gas, by far the greater number use an automatic generator of their own, and so are the gas company and the only customer. The machine located in any convenient place where there is no danger of freezing, occupies little

room, and does nearly all the work, demanding only that it be kept supplied with carbide and water, and that the waste be run off. A house-size generator is not over twenty-six by fifty-four inches on the bottom and perhaps fifty inches high, and should run at least a week without care. During this time the user turns on or off his gas with as little thought of the source of the gas as does the customer of the city gas company. It is this ease of management, with the splendid quality, that has placed so many acetylene generators in the homes of out-of-town people.

The principle of these generators is usually quite simple; a supply of gas under a gasometer is drawn on when the light is in use, and the downward motion of the gasometer caused by the withdrawal of this gas causes a small amount of calcium carbide to fall into the tank of water below, with the immediate result that enough gas is made to send the gasometer up a few inches; another drop will in the same way make a new supply. If no gas is used, none is made, and the machine will stand with its small supply for a long time without loss or disadvantage.

The calcium carbide mentioned is, as its name shows, a union of carbon and lime. It is made by melting in the electric furnace, powdered coke and lime; thirty-seven parts of the former to sixty-three of the latter. At a temperature of over 6,000 degrees F., these unite into the hard rock-like material commonly called "carbide." The general price of this is \$3.75 per hundred pounds, and a pound will make a little less than five cu. ft. of gas by simply allowing water to reach it.

GROWING USE IN TOWN LIGHTING

Besides the private generators as mentioned, acetylene is now coming to be used in a larger way, and about forty towns have a public system of lighting or a co-operative plan among a great number of the residents. This plan of town lighting is growing to larger and larger places, and is of immense advantage to the places where it is installed. The small cost of an acetylene plant as compared with the cost of an electric light plant, makes it possible to put this light into places that cannot support an electric company, and yet the town will get its light at a lower cost than the larger cities, where electric plants have been installed. The usual price of acetylene gas when sold by meter seems to be \$1.50 per 100 ft. As acetylene has twelve times the candle power of coal gas this is equivalent to the latter at \$1.25 per 1,000 ft., a price lower than prevailing, except in the larger cities. In a town in which the writer is now interested, the price has been set at \$1.20 per 100 cu. ft., equal to city gas at \$1.00 per 1,000 ft. and yet this is a small village in Massachusetts, having only about 900 inhabitants. They—more fortunate than their neighbors, who are larger in number—will have a better light than the people in Boston and at the same cost for an equal amount. This plant, which is now about half installed, will include fifty street lights for which the town pays, and lights for all the customers that can be obtained, as it is a regular corporation formed to make money by lighting this town. It is

* From the *Sibley Journal of Engineering*, Ithaca, N. Y.

probable that in the next few years the small villages will be supplied with acetylene gas as rapidly as those places with more inhabitants were supplied with electric railroads some years ago.

ACETYLENE VS. COAL GAS

As yet there is no city where acetylene and coal gas have come into direct competition; if they should, the result would be watched with interest and would depend largely on the financial management, more than on the properties of the lights. The gas companies have the advantages of being able to supply gas for heating; a field where the acetylene companies are almost barred, when city gas can be had. One solution of the fight might be a lowering of the cost of the gas of the older company, who could supply a water gas for heating at a very low price, thus abandoning the lighting field largely to the

acetylene and arc lights, while greatly extending the sales of gas for heating purposes. Before such a competition comes, however, the acetylene field will travel along the lines of least resistance, which is through the places which at present have no light; here they are welcome and have no opposition. When these villages are well supplied, and the results of the work in the small places are known, it is not at all unlikely that the present city gas companies will find a rival that will be harder to oppose than electricity has been, and the electric light companies may be obliged to resort largely to their arc lamps for their source of revenue. That some better light for small general purposes, and at a low price, is wished in all cities, is a well known fact. That acetylene can fill this want is getting to be known. To apply the remedy to the trouble is a small problem in engineering, and almost purely a financial one.

AMONG THE IMPROVEMENT CLUBS

School Gardens in Europe—How They Differ from American Gardens—A Conference of Clubs—Suggestions from Duluth Improvement Association—A Chicago Woman's Park—Prizes in Hamilton

By Charles Mulford Robinson

IN discussing last month, in this department, the movement in the United States for the improvement of school grounds, especially as illustrated by the notable work of the Woman's Union in Rochester, it was said that the now widespread effort in this country had its prototype over the seas. School gardens are far more common, and much more ambitious in extent on the continent of Europe than they are with us. But they have this difference: There, they are educational in purpose; they appeal to the interest of the public spirited as an educational factor alone; while with us they are often primarily aesthetic, appealing to civic spirit by their adornment of a bit of public property. Their cultivation of a love of natural beauty in the child and the opportunity that they offer for instruction in botany—factors common to the school gardens in both hemispheres—are, indeed, considered; but in the United States these are rarely made the *raison d'être* for their development.

SCHOOL GARDENS EDUCATIONAL IN EUROPE

When it is said, for instance, that in Germany "it was the necessities of the botany teacher that started the work," that the Austrian public school law requires for every school, "a place for the purposes of agricultural experiment," that in France "a man who has not the ability to teach horticulture cannot, under any consideration, receive an appointment as master of an elementary school," and that in Russia, in 1895, the 227 garden schools of a single province contained 111,000 fruit trees and nearly 250,000 forest trees, enough has been said to show the utilitarian characteristics of the school gardens abroad. In Belgium, every country school has not less than an acre of land about it for a garden, in Sweden there are more than 2,000 "garden schools," in Norway there is annually celebrated by school children a "Plantation Day"—closely resembling our Arbor Day—in Munich new school buildings are given 20 square feet of garden for each pupil, and, as much as ten years ago, Austria had 8,000 school gardens, while France is said to have 30,000. When these statistics are run over, it is clear that some reference to the "garden schools" of Europe is not to be omitted in a recital of the claims of those in America, even if the European are to be traced to educational systems, and not to improvement clubs. Surely, too, the advocates of school gardens for our cities can find abroad, where the garden movement has had the test of thirty years, many an argument of strict utility with which to strengthen their appeals.

CAUSE OF DIFFERENCE IN EUROPE AND AMERICA

Some surprise has been expressed that in this country, with its particular dependence on agriculture, the development of the school garden should have been aesthetic, while the European example, for all the artistic advantages of the old world, has been so emphatically utilitarian. A part of this distinction must be attributed, of course, to the fact that the movement has originated here with improvement clubs—and mostly largely with women's clubs. To a de-

gree, however, this makes any difference the more significant, for here the effort is thus "born of the people." Not a little pathetic therefore is its very obvious showing of a yearning for urban progress toward beauty. The needless dreariness and ugliness of cities is seemingly felt to be a more pressing matter than "waste" of soil, in a land where the acres are many, rich and broad. If a splotch of color, of nature's beauty in lawn and tree and shrub and flower, can be put on the crowded street, and the child can be given a love of beauty to take to his home garden, we have done something to redeem the aspect of the town.

A MODEL SCHOOL GARDEN

The American school gardens referred to last month were only those that have resulted from associated effort, and mainly from the effort of clubs. But in this country a public spirited individual will very frequently do in one place something that can be accomplished elsewhere only through the combined resources of a club. So it happens that here and there one finds a beautifully planted school garden which is the evidence of one person's thought and labor. An especially interesting example is that offered in Menomonie, Wisconsin. Senator James H. Stout and Menomonie are always associated in the minds of those who are interested in town improvement. Among the other things which Mr. Stout has done for the town is the construction of a Manual Training School. This is connected with the High School, and considerable ground—part of which was donated—surrounds the buildings. Mr. Stout was president of the School Board, and when, recently, the new structures were completed, he secured the services of Mr. Warren H. Manning, of Boston, one of the foremost landscape architects in the country, to design the grounds. The features especially characterize the plan adopted: First, broad space was reserved behind the buildings for a playground. Second, in the ornamental portion of the grounds shrubs and plants were chosen as far as possible for the purposes of study, and it is claimed that "the planting list includes at least one representative of each botanical family." In securing this it was not found necessary to violate aesthetic requirements. Third, each plant is labeled, and, further, is referred by number to its place in a handbook issued by the school, and in which one may learn the essential points of its history. From various points of view this school garden may be accepted as a model.

A SMALL GARDEN

The garden of the George Putnam school in Boston, to which reference was made last month as one of the very earliest in the United States, is notable for some other reasons. It partakes far more of the foreign (agricultural) character than do most American school gardens, and a gift of only \$10 started the work. The Massachusetts Horticultural Society has acquired no little repute for its fathering of the garden idea in this school, and yet its orig-

MUNICIPAL JOURNAL AND ENGINEER

inal appropriation amounted only to that sum. The available plot, however, was small, 48 x 72 feet, back c "the boys' playground. The society's contribution sufficed to pay for spading and enriching the soil. A small space was set aside for five important grains, and planted with wheat, rye, oats, barley, and buckwheat. Various kinds of vegetables, illustrating the individualism of plant life, fill the rest of the plot and their careful study is required. In the corners of the building two ferneries, filled with all obtainable native ferns, have been made. The garden is said to cost only \$15 a year—\$10 to the janitor for care during vacation, and \$5 for fertilizers. This shows how far in such work a little money will go.

A CONFERENCE OF IMPROVEMENT CLUBS

Of the fall items from the Improvement Clubs there is none, perhaps, of more significant suggestiveness, than the conference of the Improvement Societies of Cook County (Illinois), which was held in October. It met in a hall of the Art Institute in Chicago, and the three sessions "occupied the day and evening, a great deal being crowded into a short time. Each of the three sessions was under a different chairman and at each a different phase of the work was considered. The addresses were limited to fifteen minutes each and the subsequent discussions were confined to ten minutes. At noon a light luncheon was served, at thirty-five cents a plate, by the institute. The programme is well worth study. The conference committee consisted of Mrs. O. T. Bright, Englewood Women's Club; Miss Margaret Haley, Teachers' Federation, and Professor Charles Zeublin, school extension committee. The programme follows:

MORNING SESSION, 10:00 A. M.

*Chairman, Mr. La Verne W. Noyes, President, Civic Federation.
IMPROVEMENT BY PRIVATE INITIATIVE.*

1. Charities: Mr. Ernest P. Bicknell, General Superintendent, Chicago Bureau of Charities.
2. Settlements: Prof. Graham Taylor, Chicago Commons.
3. The Federation of Labor:
4. Housing of the People: Mr. Robert W. Hunter, City Homes Association.
5. Municipal Art: Mr. Dwight Perkins, Chicago Architectural Club.
6. Local Improvement Societies: Mrs. Gertrude Blackwelder, Morgan Park Improvement Society.

AFTERNOON SESSION, 2:30 P. M.

*Chairman, Supt. Orville T. Bright, Cook County Schools.
IMPROVEMENT THROUGH CITIZENSHIP.*

1. Publicity: Mr. William Kent, Municipal Voters' League.
2. Tax Reform: Miss Margaret Haley, Teachers' Federation.
3. Unification: Mr. Harry S. Mecartney, Attorney, Civic Federation.
4. Winnetka Town Meeting: Mr. Frederick Greeley, of Winnetka.
5. Public Baths and Gymnasiums: Miss Mary McDowell, University of Chicago Settlement.
6. A Cook County Park System: Alderman W. S. Jackson, Chairman, Special Park Commission.

EVENING SESSION, 8:00 P. M.

*Chairman, Mr. John H. Nolan, Treasurer, School Extension Committee.
PUBLIC SCHOOL EXTENSION.*

1. The Public School System: Supt. E. C. Cooley, Chicago Schools.
2. Art in the Schools: Miss Ellen Gates Starr, Public School Art Society.
3. A Winter's Program: Miss Jane Addams, Hull House.
4. Public School Extension: Prof. Charles Zueblin, Chairman, School Extension Committee. (Illustrated by lantern slides.)

It may be well to say, as illustrating the confidence of the meeting itself in the usefulness of such a conference, that before adjournment the committee was reappointed for the continuation of the work. Co-operation and federation are the order of the day, and the clearing house of ideas may be a great aid to swift, sure, clear-headed business.

DULUTH IMPROVEMENT ASSOCIATION

The Duluth Improvement Association has issued a very attractive and interesting fly sheet of "Suggestions." It says: "Nature has done even more than her share in beautifying Duluth. It now only remains for the people of this city to take advantage of natural conditions, clean the streets, alleys and lots, take down front fences, have continuous, well trimmed lawns in front and rear of houses in each block, set elm trees for street shade, plant shrubs and flowers in suitable places, and Duluth will become one of the most beautiful cities on this continent." Co-operation is explained, and the formation of local improvement organizations in every neighborhood is urged, with a special recommendation to young people to undertake the work. Under the head, "How to Begin," the association gives practical advice, which I may summarize: Talk to one or two friends and get them interested; secure the use of a school room or public hall and appoint a meeting for the purpose of organizing an im-

provement society for the locality; arrange with some good speaker to talk on the subject. The election of officers and appointment of several committees, to consist of three persons each, will follow. There should be, the association thinks, a committee on finance, to determine the charge for membership and secure funds; a committee on cleaning streets and alleys, on removal of front fences, on grading and sodding and on care of lawns, a committee on trees, and one on painting, to induce the owners of telegraph, telephone and trolley poles, and of delapidated outbuildings to have them painted. The value and pleasure of the work, its fitness for all seasons, are pointed out. It is declared that "in no way can the earnest evangelist do more permanent good for a community," or "a church society more rapidly advance the cause of Christianity than by the establishment of an improvement society." "In this work are taught all the nobler ideas of living and working for others." It urges that there be constant recollection that "it is not imposing or costly buildings which make a charming home; or money—but taste and labor—which makes beautiful surroundings." At the bottom of the second page, and running clear across it in large type are the words, "Any one—man, woman, girl or boy—who takes an interest in helping to beautify Duluth, and wants any further explanations in regard to how to go about this work, will please call at the office of the Duluth Improvement Association."

Here is a way to bring home to the individuals of a community the sense of personal opportunity. The appeal is to civic pride. It contains no fault finding. At the very beginning it praises the natural advantages of Duluth. The suggestions are practical. There is nothing visionary and impossible about them. Beginning and ending with the home, the street, and the garden, the "City Beautiful" becomes through it a near and real thing.

A CHICAGO WOMAN'S PARK

A Chicago woman who did what she could to make her city more beautiful by taking the opportunity nearest to her own hand and working perseveringly and faithfully at that has gained a result that has put her name in all the papers, her picture in some of them, and has given to her "easily the first" honorable mention in the Chicago Tribune's awards for gardens. At a certain point where three streets meet in Chicago there is a triangle designed as "Green Bay Park." The triangle failed to live up to its name. It was not a park, and it did not flourish as a "Green Bay." In course of time the abutting streets were built up, one of them with stores and the other two with residences; and the triangle filled up with rubbish and cans. In one of the residences lived Mrs. H. H. Kellogg, the wife of a wool merchant. The misnamed park was to her a constant source of annoyance, violating all her civic ideals. The triangle was under the care of the North Side Park System, but it received no care. Mrs. Kellogg appealed repeatedly to the municipality for its improvement, and after a long time she persuaded the city to remove the refuse, sod the plot, and make a few flower beds. Then she interested her neighbors, secured contributions from her husband, and began a work of positive adornment that now gives very creditable results and has made the little oasis one of the best known in Chicago. In a letter to the MUNICIPAL JOURNAL AND ENGINEER Mrs. Kellogg says: "Two years ago I induced the city to give a few flower beds; and this past summer, not being satisfied with what was provided, I induced my friends and neighbors to donate plants, so that the park has been very beautiful. I find that old trees and stumps are ornamental when covered with vines. Next year I shall use the wild grape vine on trees just outside the walk about the park. I have just been given control of the park by the city, the latter furnishing the same amount as last year and a man to do the rough work, the mowing, sprinkling, raking and weeding. I trim all the vines myself and clip dead leaves, etc. As to the cost, it depends upon the plants. I use geraniums, scarlet mostly, which can be obtained at wholesale for six cents a plant. A fine bed is made of scarlet geraniums with canna in the center. I also had one bed of canna alone—ninety plants in a circular bed of twenty-four feet diameter. Elephant ears are dotted here and there all over the park, but they need great quantities of water." She adds, very modestly, "I scarcely know what else to write—except that I am enthusiastic on the subject of making my ward and city more beautiful." One

of the Chicago newspapers which attempted an interview with Mrs. Kellogg quotes her as saying: "Praise the park, but don't praise me. We have the city gardener interested now, and the inspector, and the neighbors, so I guess Green Bay Park has come to stay." And this is to be noted, for the special merit of the case is its suggestiveness as an example. There is probably not a city, town, or village in the country without somewhere in its corporate limits a barren, neglected, bit of ground such as Green Bay Park used to be. If the community will not redeem it the neighborhood, or an individual, or a club, can.

PRIZES FOR PRETTY LAWNS IN HAMILTON, ONT.

As if to prove the truth of this contention, there was a somewhat remarkable meeting one November evening in Hamilton, Ont. It was such a meeting as could not be paralleled anywhere in Canada, though its like is not exceedingly rare in the United States, or even England. The meeting was held in the rooms of the Board of Trade, which were crowded to their utmost capacity, and the attendance included all sorts of people—professional men, business men, laboring men and many women. It was held under the auspices of the City Improvement Society, the only one—distinctly as such—in Canada, and the occasion was the distribution of prizes for the society's competition for the best kept lawns and flower decorated house fronts. The prize money, amounting to about \$200,

had been secured by a canvass of public spirited citizens, and it was divided into a multitude of small prizes. In order that the competition might be entirely fair, opportunities varying greatly with different neighborhoods, the society divided the city into streets and districts, and the streets when necessary, into sections, and for each section offered three prizes: \$4, \$3, \$2. So there were formed, conditions being approximately alike within each group, twenty-three groups of competitors. And so generally had the people participated in this lovely contest that the judges found it necessary to supplement the list of prize awards of almost every group with a list of "honorable mentions." It is no surprise, therefore, to learn that the hall was crowded, nor to read among the speeches the statement that the seedsmen and florists of Hamilton declared that they had "sold more seeds and plants to city people in this year than in any two years previous," nor to find the president declaring, in his opening address, that in the society's two short years of life it had already attained in public's eyes an importance of position for which its organizers had not dared to hope. Continuing his address, the president, Mr. R. T. Steele, described the improvement the society had brought about in the street cleaning and garbage collection, and though he criticised the city administration freely and frankly, the Mayor, rising to speak before the meeting closed, congratulated the society on its work and assured it of the sympathy and interest of officials.

THE VALUE OF OILED ROADS

By W. G. Ambrose*

It is said that in the United States it costs the farmers more in the aggregate to haul their produce to the nearest railroad station than they pay for freight rates to the railroads.

In the great valleys of California there are no summer rains; the topography of the country is such that the fine particles of soil suitable for plant growth, but not for road making, are washed from the mountains, which makes driving a very serious business.

Previous to the discovery of oil in large quantities in the state and its consequent low price, there seemed to be no remedy within a reasonable limit of cost except the sprinkling with water or covering with straw, though the supervisors dutifully spent the county's money each year, putting up a grade and thereby driving the unfortunate farmer off the road and often into the adjoining wheat field to escape the alleged improvement.

Strawing the road, however, costs about \$30 a mile, is only a temporary remedy and often is not available at all. Sprinkling with water is very ineffective and very expensive.

Mr. H. A. Jastro, Supervisor of Kern County, in a paper read before the San Joaquin Valley Association at Stockton, told of the spending of \$35 a mile per month during the dry season in sprinkling with water, and said that there never was a day when he could say he had a good road. Supervisor McLaughlin, of Kings County, told the writer of spending over \$40 a month per mile with similar results, and one interior town in California is spending nearly \$8,000 a year sprinkling with water, or enough to make a good job of oiling them each year.

The Kern County oil used for sprinkling has a gravity of 14 to 16 degrees Baume and contains a little less than 60 per cent. asphalt which is non-volatile. The remainder, consisting of benzine, gasoline, naphtha, etc., is volatile and its function in road making is to dissolve the asphalt so that the sand or soil may become saturated with it, after which the volatile matters is evaporated.

It is evident, then, that it is necessary and sufficient in order to obtain the best results that the road material which is stirred up by traffic shall be all saturated with oil, and, as enough oil to do this applied at once would be too liquid and would run off the road, that condition must be reached by successive oilings, the number of which will vary with the depth of stirred-up material, running from hard pan to loose sand.

The dust on a road rises because the particles of sand, mica, clay, etc., are so small that the wind can lift them. But the asphalt

changes all this by sticking these particles together, so that the resulting mass is too large to be blown about.

The mud in winter is due to the presence of water between the particles of clay, making mortar. But if we fill these interstices with asphalt there is no room for the water and it must run off.

In making city street asphalt pavement, the contractor mixes sand with his asphalt, gets the proper consistency for his material by the application of artificial heat, and employs laborers and steam rollers to spread and tramp his material, getting a very excellent and very expensive result.

The question whether oil should be heated or not is often asked. The answer seems to depend on the thinness of the soil and the rapidity with which we want it so run out of the sprinkler. If the oil is so thick that it runs very slowly, it must be warmed; but if it flows readily no warming is needed.

In Kern County excellent results can be seen both where the oil was heated and where it was not. So it appears that the matter of temperature is of little or no importance.

The result toward which all efforts must be directed is the complete saturation of the shifting road material with oil in whatever way that end may best be attained.

One objection to the use of oil is that when first applied the volatile matter gives off an odor which, to some people, is offensive; and that the oil may be thrown by buggy wheels on the traveler and damage his clothing; and a third is that the oil is bad for rubber tires. All these objections apply to newly oiled roads and for a few days only while the volatile matter is escaping, and they are all overcome by oiling a portion of the road at a time and leaving it to dry before using; or by harrowing the oil into the sand.

In the matter of cost it is safe to say that a road can be thoroughly oiled during a series of say three years for less than sprinkling with water would cost in one year. And after those three years no oiling will be needed except on account of foreign matter added to the road mentioned.

A total of \$300 to \$350 a mile in three years, of which say one-half the first year and one-fourth in each of the following two years, will at present prices of oil make a good job on an ordinary county road.

It seems clear that as soon as the people realize the great economy and great comfort to be attained by oiling the roads, the amateur road maker finally will cease from troubling, and the water sprinkling wagon will be at rest.

* California Municipalities.

LOWELL AND ITS SOLUTION OF THE PAVING PROBLEM

A Typical New England City—Fine Public Buildings—Progressive in Its Policy—How It Built a Half Mile of Bituminous Pavement—Splendid Work of Its Street Department

By Walter J. Somers, C. E.



P. F. BRADY,
Superintendent of
Streets.

LOWELL is one of the most enterprising and important cities of New England. It is famous for its water power developments, which are among the oldest in this country, the waters of the Merrimack river having been utilized for this purpose for almost a century. This form of power makes possible enormous growth in manufacturing lines. The Lowell mills are among the largest and richest in the country.

In the administration of public affairs the city is to be congratulated. It has a beautiful City Hall and Public Library, which rival any in the State of Massachusetts.

In municipal improvements Lowell sets an example which other cities would do well

to follow. Like many other New England cities, all public work is done by day labor; bridges are constructed and large sewers built, the work being done entirely by the city laborers paid by the city and directed by the heads of the departments through the foremen. The city owns and runs two large crusher plants each set up in quarries belonging to the corporation. They turn out thousands of tons of crushed stone every year for use in road building. They are well equipped in this department, having their own stables, teams, rollers, etc., all of which are essential to

asphalt contractors, who have previously combined among themselves in controlling the work. He has used city labor and only employed two non-resident men in its execution, and has educated a force which will in the future permit work to be done without outside assistance.

The street was first excavated to a depth of eight inches below the finished grade. Two and one-half-inch trap rock, from the city ledge, was then spread and rolled so that after its ultimate compression with an 18-ton roller the surface would be two inches below the proposed finished surface of the pavement. The stone foundation thus prepared was then coated with Warren's Liquid Bituminous Cement, which united readily with the cold stone. It was then spread with a coating of hard bituminous cement, which bound the stone together in a firm mass, thus distributing the pressure from the loads over a large area.

On the top of the foundation thus prepared was laid two inches of the waterproof pavement, the work being done under the Warren patents, for the use of which no charge was made, except the ordinary price charged for the bituminous material. The mixture used in the surface was recommended by the patentees, Messrs. Warren Brothers' Company, Boston, Mass., who have furnished similar services to a number of cities in New England.

The materials used in the mixture were pulverized limestone, crusher screenings, one-half-inch stone and two-inch stone and



ROLLING IN SCREENINGS TO GIVE ROUGH SURFACE AND COLOR.



THE FINISHED PAVEMENT.

economical construction. This department of the city's business is planned and carried on by the Superintendent of Streets, the legislative and executive departments being quite distinct from each other.

The present Superintendent of Streets, Mr. P. F. Brady, is a man of wide experience in public work and is looked on by the tax-payers as the right man to be in charge, being a thoroughly conscientious and hard-working official.

Mr. Brady has just finished laying about one-half mile of bituminous macadam paving, doing all the work by day labor. Such machinery as was necessary to be added to his crusher plant was rented, and one of his macadam gangs was turned in on the work with very satisfactory results. In fact, it is the general belief that the Superintendent has struck the key to the road problem for Lowell, having produced a pavement which gives every indication of being more durable than asphalt, and much less slippery, and at a very much decreased price.

The building of the road has been watched by the public at large, and a great amount of praise has been directed toward Mr. Brady for his diligent work in securing to the city a good pavement at such moderate cost. He has naturally encountered the opposition of the

bituminous cement mixed together in definite proportions. A large proportion of the two-inch surface coat is trap rock. The several ingredients were heated to a high temperature and thoroughly mixed in a modern plant especially adapted for the purpose, so that when the material was hauled to the street it could be spread with rakes while hot in a manner similar to the ordinary asphalt pavement. The material was rolled after being spread with a heavy steam road roller weighing 18 tons until the surface was fully compressed and welded into the foundation, forming a dense, compact mass from the foundation up. One-half-inch trap rock screenings were then spread over the surface and rolled into the pavement and thoroughly united with it, forming one of the most excellent footholds for horses, and the next day after completion the road was thrown open for traffic.

Several photographs were taken during the progress of the work, one of which gives a view of Superintendent Brady in his buggy directing the work. Photographs were also taken of the mixing plant, the quarry and crusher.

It is the belief in Lowell that the pavement just laid is the commencement of a new era in road building in that city.



I. PORTABLE BITUMINOUS MACADAM PLANT OF WARREN BROTHERS AT WORK AT LOWELL—CAPACITY, 700 SQUARE YARDS PER DAY. 2. LOWELL'S STONE CRUSHER AT WORK WITH BITUMINOUS PLANT. 3. LOWELL'S STONE QUARRY. 4. COATING FOUNDATION WITH LIQUID BITUMEN, JUST AHEAD OF THE FINISHING COAT. 5. ROLLING THE FOUNDATION. 6. SPREADING AND RAKING HOT MATERIAL AND ROLLING WITH HEAVY ROAD ROLLER

THE WORK OF SOUTHERN GOOD ROADS TRAIN

Spectacular Road Building—Made Possible Only by Co-operation of Manufacturers and Railways—Widespread Demand for Better Highways—Another Good Roads Special to Start After Christmas

By Our Special Correspondent

GREATER advancement in the improvement of our public highways has been made during the past twelve months than in any previous five years in the history of this work. The most active factors which have made this achievement possible have been Hon. Martin Dodge, Director of the Public Road Inquiries Department, of Washington, D. C.; Hon. Horatio S. Earle, State Senator of Michigan; Hon. W. H. Moore, President of the National Good Roads Association, and the Illinois Central and Southern Railways, besides several prominent manufacturers of road building machinery. Millions of

feet of stone, sand, gravel, and other materials have been handled by the various manufacturers, and the roads constructed have been built at a cost of millions of dollars.

This train carried a most perfect stone crushing plant, and at most of the points, where roads were constructed, the stone required was unloaded and crushed at the site of operations. The crushing plant embodied a crusher of good capacity, an engine and screens. The screens used separated the stone by one operation, as it were, into three different portions. The one-inch screen gave a three-quarter inch product, the two-inch screen gave a one and one-half inch product, while the larger stones passed out at the end of the screen forming the two and one-half inch product. The material was handled in wheelbarrows, and a continuous economical administration of the plant was assured.

As in the case of former campaigns of this character the representatives of the National Good Roads Association, who accompanied the train, did not support any particular class of highway, although they favored the macadamized system wherever it could be built. One of the most remarkable achievements in road building was at Greenville, Tenn.

PREPARATIONS IN ADVANCE

Previous to the advent of the Good Roads Train there was not one foot of macadam road in Greene County, nor had a single foot of this class of highway ever been built in the county or one piece of road-making machinery been in use there. The road selected for the experimental work is the highway which connects Greenville and Tusculum College. The section improved constituted the worst stretch of the entire road, it being narrow, irregular and rutty, and with a clay soil that was extremely difficult to work. Moreover, it was full of gullies, and there were fills of ten feet.

The section improved was a quarter mile stretch, around the side of a steep hill. The soil, as is the case with most of the roads in eastern Tennessee, is a red clay, which is very hard when dry and spongy, sticky and soft when wet. The ordinary earth roads over such soil are fairly good during the summer and autumn, but are made well-nigh impassable by the winter rains.



SOUTHERN GOOD ROADS TRAIN LEAVING WASHINGTON

dollars have been expended, and even a large amount of work has been planned for the next twelve months.

The first Good Roads Train was started last year on a short route through Michigan by Senator Earle, and drawn by traction engines. The next left New Orleans in the early spring of this year, under the auspices of President Moore of the National Good Roads Association and the Illinois Central Railway. The third Good Roads Special left Washington, D. C., on November 1, for a trip through the South, under the auspices of President Moore and the Southern Railway. The route led through a section where the difficulty of providing good roads is greater and the need for better highways more urgent than in any other section of the country. The train has made stops of from three to five days' duration at Winston, Salem and Asheville, N. C.; Chattanooga and Greenville, Tenn.; Birmingham, Mobile and Montgomery, Ala.; Atlanta, Ga., and Greenville, S. C. How great was the interest in the work throughout the section visited may be imagined from the fact that before the train left Washington requests had been received from more than two hundred towns and cities of the Southland that practical demonstrations of road building be given within their corporate limits.

EQUIPPED WITH UP-TO-DATE MACHINERY

The special train consisted of ten cars, equipped with all the necessary machinery for the construction of roads. It is a matter of no small interest to know that this equipment was furnished by the Good Roads Machine Company, of Kennett Square, Pa.; The F. C. Austin Company, Harvey, Ill.; The Western Wheel and Scraper Company, Aurora, Ill.; Aultman Company, Canton, Ohio, and the Buffalo-



THE STONE CRUSHER AT WORK

Several deep fills were made in order to give a uniform grade of 3 per cent. For this work eight-wheeled scrapers, several drag scrapers and two plows were utilized. The drag scrapers were used where dirt was secured from borrow pits close at hand, while the wheeled scrapers were introduced where the length of haul ranged from 200 to 300 feet. The road grader was also employed in shoveling the earth from the upper to the lower side of the road, thus increasing the width. As soon as the sub-grading was secured the road machine was utilized in cutting shoulders on either side of the road ten feet apart. The foundation was given a slight crown and these shoulders were left eight inches in height. Stone was then placed on the foundation in three separate layers. The two and one-half inch stone was placed on the bottom, the one and one-half inch stone next, and finally the three-quarter inch grade and dust was employed for the surface, or, as it is commonly known, the "binder." Native limestone was used for the foundation and for surfacing.

HOW THE ROAD IS BUILT

The foundation course was five inches in thickness. This was thoroughly rolled before the second course was spread on. When the one and one-half inch stone was put in place it was thoroughly sprinkled and rolled, and this operation was repeated in the case of the "binder." The side ditches were dressed up by the road machine. During the last two courses the roller began at the sides, rolling the shoulders first and gradually working to the center. The side ditches were given the same slope as the finished surface; that is, about three-quarters of an inch to the foot. The work at Green-

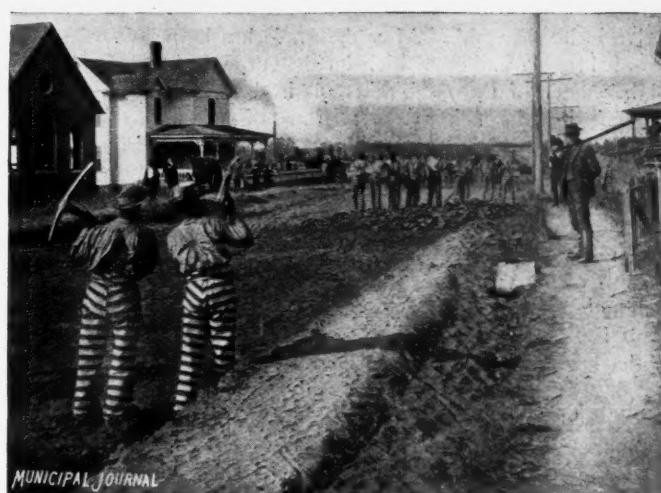


THE ROAD ROLLER AT WORK AT ASHEVILLE, N. C.

ville was commenced on Friday, and by Saturday night over 1,000 feet of sub-grade was completed. For the entire work only four days of ten working hours were required. The force employed consisted of thirty laborers, ten road experts for the operation of the machinery and twelve teams.

At Chattanooga the soil is similar but different material was employed. The road building programme embraced the construction of 300 feet of limestone road, 1,000 feet of earth road and 300 feet of road in which chert was employed as the principal material. The chert road was especially interesting from the fact that this material was put on in a single layer eight inches in thickness, and this was rolled with a sixteen-ton roller as compared with the ten-ton steam roller which had been employed in the road building at Greenville. The shoulders and foundation of the chert road were constructed, however, in the usual manner. The crown of the chert road, owing to the fact that the material is softer, was given greater slope; that is, three-quarter inch to the foot fall from the center to the sides, as compared with a fall of one-half inch to the foot in the case of the macadam road.

The road building at Birmingham, Alabama, differed from the others because large quantities of furnace slag were used in combination with the chert, the former being used for foundation purposes and the latter for finishing and as a "binder." In the vicinity of Birmingham over three miles of roadway had been laid off for the operations of the road makers, but owing to the grading encountered it was found impracticable to complete more than three dif-



MUNICIPAL JOURNAL

CONVICTS USED FOR ROAD BUILDING

ferent stretches. In Jefferson County, outside Birmingham, a section of 1,000 feet was graded and rolled, and at Avondale, a suburb, and within the corporate limits, stretches of 500 feet each were macadamized, slag and chert being employed.

THE WORK AT BIRMINGHAM

The grades in the vicinity of Birmingham were such as to permit the introduction of the heavy dirt working machinery, which constituted a most interesting portion of the equipment of the train, and which it had been found impossible to employ to advantage in the hilly country previously visited. A most important demonstration was given by a Western elevating grader in reducing a cut 500 feet in length, and of an average depth of two feet. This machine elevates earth and drops it into wagons alongside, loading a wagon in twenty seconds. Operating under ordinary conditions an elevating grader of this type is capable of loading from 700 to 800 yards of earth into wagons in a working day of ten hours. The machine is, of course, very heavy, and requires the use of ten or twelve horses, some pushing and some pulling. Three drivers are employed and two machine operators. One of the latter devotes his attention to the plow, while the other directs the movements of the elevating apparatus.

The proper management of one of these large elevating graders is one of the most difficult phases of modern road making. The management of so great a number of horses is of itself something of a problem and should the machine strike a sudden declivity there is danger that the earth, instead of falling into the wagons as intended, may be hurled over onto the backs of the horses, frightening the animals. However, the accomplishments of the machine more than compensate for the care necessarily exercised in its operation. The scope of its operations is great. The plow makes a cut twelve inches square; that is, the plow cuts into the earth bank to a depth of twelve inches, and also carries to the conveying belt a cut of earth



MUNICIPAL JOURNAL

PUTTING ON THE FINISHING TOUCHES

twelve inches in width. After the grade has been reduced this machine is brought into requisition for the purpose of elevating the earth to the center of the road, where it is deposited, the graders then spreading it and giving a uniform crown of one inch to the foot from center to sides. Finally, the road is rolled with the steam roller. The method of procedure was the same in cases when, as previously mentioned, a stretch of road was covered with slag and chert.

The operations of the road makers at Asheville and Winston-Salem were not materially different from those already outlined. At both the last mentioned places the soil worked was a clay loam. Road building experts always claim that the cost of constructing sample roads is far above that of regular road making, where the work is in the hands of a contractor, or where preparations are made for carrying the work on for some time, and the evidence afforded by this most recent Southern tour would appear to bear out the contention.

COST VARIES ACCORDING TO LOCAL CONDITIONS

Local difficulties usually rob of any significance cost statements bearing upon the construction of sample roads and those made

during this tour do not appear to be any exception. For instance, at Greenville, Tenn., there was secured a crew of laborers who did not work well together for the first day or two, and these when combined with a lot of green teams retarded the progress of operations considerably. On another occasion a heavy downpour of rain stopped the work for a day after a roadbed had been nearly filled and made ready for rolling and surfacing, and it was found necessary to divide the train and leave a portion of it behind in order to complete the work. This Southern trip did, however, demonstrate one thing very conclusively; and that is, the efficiency of convict labor for road-making purposes. Convicts were employed at several points, and the character of the work performed clearly points a solution to the problems presented in various parts of the South where other labor for road-making operations is well-nigh unobtainable. Such has been the success of this road-making expedition that the officials of the Southern Railroad—including, of course, President Spencer, who has always taken a great interest in the subject of good roads in the South—have practically decided to send out immediately after Christmas another train which will operate more extensively.

CHANGES NEEDED IN THE CROTON DAM

Serious Defects Found in Present Plans—Complications Plainly Pointed Out—The Only Remedy Recommended



W. R. HILL,
Chief Engineer

THE Board of Engineers that was appointed June 21, 1901, to consider the plans of the earthen embankments of the New Croton Dam and Jerome Park Reservoir, has handed in its report to the Aqueduct Commissioners of New York City. The following condensation of the report on the New Croton Dam has been made, showing the recommendations of the Board and some of its reasons for them:

LARGEST DAM OF ITS KIND

"There is no earthen dam of equal magnitude in existence, so far as we can learn, and there are, therefore, no precedents to guide us in forming an opinion as to be made safe. As regards the stability of such a structure against overturning or sliding on its base, no question can exist. The point to be considered is whether an earthen dam like this can be made sufficiently impermeable to water to prevent the outer slope from becoming saturated and thus liable to be washed out and slide.

"Whether such a result can be accomplished depends largely upon the character of the material employed in the construction of the bank. We examined the material which has been used in the building of the embankments so far constructed, and we made some experiments on the permeability of the material when placed in embankment and when subjected to the action of water. We also procured several samples of material taken from the embankments and from pits in the vicinity, giving a fair idea of the nature of the materials which have been and which may be used in the banks, and had tests of them made by the Hydraulic Laboratory of Cornell University. All the tests indicated that this material, which we found to be almost identical in character with that which has been used in the construction of all the earthen dams in the Croton Valley, is permeable to water under any head from 3 to 150 feet, and that when exposed to the direct action of water it disintegrates and assumes a flat slope, the surface of which is best described as slimy.

"In a well-built earthen dam, the various classes of material are thoroughly intermingled, forming a mass better adapted to resist such action by the water of percolation, but it is never

safe to permit such water to appear on the outer slope of the embankment.

COMPLICATED SITUATION

"There are in the Croton Valley six earthen dams of heights varying from 50 feet to 90 feet, which have been in use for from three years to twenty-three years, and we accordingly secured from the Chief Engineer of the Water Department permission to test the actual extent of the saturation of these embankments by driving pipe wells into them at different points and noting the elevation at which the water stood in such pipes.

"In all of the dams on which observations were made, the entire bank on the water side of the core-wall appears to be completely saturated. On the opposite side of the core-wall, water was found to be standing in the embankment in every case. The extent of the saturation of the outer banks of these reservoirs varies greatly. These variations are doubtless due to the difference in the material employed in the banks, the degree of care taken in building the banks, and to the age of the embankments.

"The slope of the surface of the saturated water in the bank is determined by the solidity of the embankment. The more compact



END OF MASONRY DAM, CORE-WALL AND PIT FOR EMBANKMENT—UP-STREAM FACE OF DAM



CORE WALL; END OF MASONRY DAM AND PIT FOR EMBANKMENT—LOOKING NORTH

the material of which the bank is built, the steeper will be the slope of the saturation.

"Comparing all the data obtainable and our observations of the character of the material employed and the work already done, we are of the opinion that in the New Croton Dam embankment the loss of head caused by the core-wall may be assumed to be 17 per cent. of the depth of water in the reservoir, or 21 feet, and that the slope of saturation may be assumed at 20 feet per 100 feet.

"On this basis, which is a liberal one, the maximum height to which an earth embankment, with its top 20 feet above the water line and with outside slopes of two to one, can be built with safety, is 70 feet.

"From our observations, experiments and tests of the material used in the embankments already made and the manner in which it has been put in place, we are of the opinion that the 150 feet of bank adjoining the end of the masonry dam would in time become unstable and unsafe if built as designed.

"The trouble might be overcome to some extent, by flattening the slope of the banks and adding about 300,000 cubic yards of embankment, so as to bring the probable slope of saturation not less than ten feet below the surface of the bank. This would extend the toe of embankment some 250 feet further into the valley, would add largely to the cost and would disfigure the appearance of the dam.

"Or the lack of stability might be to a considerable extent overcome by placing the lower slope with a revetment of heavy block stone paving with a backing of broken stone. This, too, would disfigure the dam and add largely to the cost.

"In either case, the permanent stability of the bank would be still a matter of great doubt, for it must be borne in mind that this immense bank is founded partly on a rock surface sloping down towards the valley at the rate of 50 feet in 100 feet, and partly on the excavated face of a bank of the natural earth which in turn rests on the same sloping rock surface.

"Supposing, as we safely may, that an embankment seventy feet in height may be constructed on the plans and of the material demanded by the specifications for the New Croton an element of uncertainty is introduced when such an embankment is placed, as it is here proposed to do, on top and at the edge of an artificial bank of earth 100 feet high, built in detached sections, as this bank must necessarily be built, and sure to be saturated with water from a reservoir 125 feet deep behind it, and the ground water from a steep hillside adjoining it. This uncertainty arises chiefly from the fact that the settlement of a bank thus constructed must be very irregular and the liability to cracking and deformation great, being built at different times and of various kinds of material. There is

no way in which such irregular settlement can be avoided. It will take place largely during and after the filling of the reservoir with water, and there is no way in which cracks in the embankment which may have once opened to permit the passage of water can be closed. The percolation of water through the bank, at any but the lowest velocity, would endanger its stability beyond repair, and no amount of additional earth placed upon its slopes would suffice to make it permanently stable.

"The only alternative is the continuation of the masonry dam of its full section, for the remaining portion of the work. The extreme southerly end, about 140 feet long, south of the gatehouse controlling the inlet to the old aqueduct, where the top of the dam would be thirty feet above the natural surface, might be made an earth embankment. The additional expenditure required to change the 290 feet between the gatehouse and the present end of the masonry dam from earth to masonry would be about \$400,000.

"There should, however, be precautions taken against extraordinary contingencies. One such contingency which might arise is the occurrence of an extremely heavy rainstorm or cloudburst in the Croton Valley, or the failure of one of the large dams further up the valley, which might bring down a volume of water which the wasteway of the dam would be unable to carry off as rapidly as it came, and the dam would be over-topped, in which case the earthen embankment as at present planned, with the top at the same elevation as the top of the masonry dam, would be carried away.

"We consider that both the original and the present plans are injudiciously designed, in view of the possibility, remote though it may be, of such an excessive flood. If any portion of the dam is to be made an earthen embankment, it ought to be constructed at least ten feet higher than the crest of the masonry portion of the dam, and the masonry dam should not in any case be built higher than was originally designed. Such a change destroys the harmony and fitness of the design, which, having been scientifically determined, should be rigidly adhered to.

"In our opinion, the absolute security of the dam against disaster, the architectural and aesthetic harmony of the structure and the general feeling of security in the public mind would be satisfied only by the substitution of a masonry structure, similar in design to the rest of the dam, for the earthen bank proposed by the present plans.

"We therefore recommend that the plan of construction of the southerly end of the New Croton Dam, from the end of the present masonry dam to the gatehouse controlling the inlet to the old aqueduct, be modified as to be in conformity with the plans for the masonry dam as originally designed and now in course of construction.



CORE WALL AND WALL AT END OF MASONRY DAM AND PIT FOR EMBANKMENT—AUGUST, 1901



PUBLISHED MONTHLY AT 253 BROADWAY, NEW YORK CITY

C. M. PALMER, PROPRIETOR

WILLIAM S. CRANDALL, Editor
 WEBSTER WAGNER, Assistant
 J. W. HOWARD, Engineering Editor

JOHN B. BENNETT, Business Manager

E. J. HERMANS, Manager Western Office, 520 Monadnock Block, Chicago, Ill.

Advertising Department:
 E. T. WHITE CLAUDE G. DUNN

TERMS OF SUBSCRIPTION

(In advance.)

United States and Canada	\$3.00 per year
Foreign Countries	4.00
Single Copies, each . . . . .	.25

Entered at the New York Post Office as second class matter

NEW YORK, DECEMBER, 1901.

EDITORIAL COMMENT

THE so-called "rummage sales," conducted by the local church and charity organizations, in various cities may increase the revenues of such organizations, but they may also be the means of increasing the death rate.

THE city of Jacksonville, Fla., has recently passed a tree planting ordinance which provides for the beautifying of certain streets by the planting and caring for the trees. There are many practical and æsthetic reasons why every American municipality would be benefited by the passage of such an ordinance.

THE city property committees and departments could do much to earn their salaries by having door checks and springs used upon the doors of all public buildings. Large business corporations use them for economical reasons. Why not use them for the same purpose in all municipal buildings and so save some of the taxpayers' money?

FOR many years European cities have been obliged to purify their sewage before it was discharged into rivers or other waterways. American municipalities are almost totally indifferent to the evils which may arise from this bad practice. There is a growing sentiment, however, which favors a discontinuance of this evil, but it may take several epidemics to convince the majority.

THE asphalt pavements of Columbus, Ohio, have recently been much damaged by the building of bonfires and burning of leaves by children and citizens. When the asphalt becomes heated through by a bonfire it is practically destroyed, or so damaged that disintegration will soon follow. This means a loss to the city at the rate of from \$1.50 to \$2.50 per square yard. Columbus proposes to stop this nuisance.

THE use of the various modern filing devices which facilitates transaction of public business is becoming more popular with city officials. There are a few, however, who do not yet understand how card indexes and other modern office appliances can be made to lessen labor and increase efficiency. It would not be a bad idea to con-

sider the merits of some of these modern inventions, including book-typewriters.

NEARLY every city of 10,000 population and over in this country needs to pay greater attention to the destruction of its refuse. It is no longer considered good sanitary practice to dump refuse on unused land in the suburbs. There are several kinds of satisfactory refuse incinerators now in use. There seems to be a good deal of unnecessary delay on the part of many cities to introduce this very essential practice.

THE curbing which is used in many of our large cities, and nearly all of the smaller cities is not calculated to present that æsthetic appearance which is so desirable in the improvement of a street. The practice of the last twenty-five years seems to have been that "most any old thing," in the way of a curb, would answer the purpose. The tendency nowadays, however, is to correct this defect by the use of the modern steel-edge curb and others of equal quality.

THERE is no country in the world where the loss of life by fire is more frequent than in the United States, and there are no cities where the regulations governing the use of fire escapes should be more strict because construction regulations are, comparatively, so lax. Every public building, factory, hotel, school house or other structure of three stories high or over is unsafe without the equipment of a fire escape. It is about time that civic authorities began to pay more attention to this need.

THE carelessness displayed in the lack of methods employed for preserving from loss, by fire, of the municipal records, is one of the things to be criticised in American cities. Within the past year the records of twenty-seven cities have been wiped out of existence, not to mention the many other minor losses that have taken place during that period. This is a fault which the investment of a small amount of money would correct. There are well known systems which are not expensive, and are within the reach of any municipality.

THERE are no cities in the world which spend more money, per thousand population, for lights than those in America; at the same time there are few which mix so little brains in the planning of systems of municipal lighting. Lights of high candle power are put where they will do no good, and lights of low candle power are placed where high candle power should be used. The use of acetylene, gasoline, hydro-carbon and other lights of similar characteristics could often be used to better advantage than the more brilliant arc lights. What some of our American municipalities need in this particular is an inspiration of common sense.

THERE is a great demand for a well constructed macadam pavement. The practice among cities of owning and operating plants for producing crushed stone to be used in macadam construction is rapidly growing in favor. There have been notable efforts to improve the permanence of macadam pavements. During the past season bituminous macadam has been introduced with satisfactory results in several New England cities. This type of pavement will also be used in a number of other municipalities in the East and Middle West the coming season. Reliable engineers believe that it will stand the test of time, and in future it is likely to become one of the important permanent pavements.

DULUTH, Minn., contemplates taking another step in municipal ownership of public utilities. It is now proposed that the city establish its own plants for the manufacture of street paving material; one for ordinary macadam and bituminous macadam, and the other for creosoted blocks for wooden pavements. It is a well known fact that bituminous macadam gives a smooth surface which is comparatively dustless, not slippery, and durable. The city has quarries of trap rock which could be utilized for a stone crusher. The city of Springfield, Mass., saves thousands of dollars every year by constructing many of its own pavements. It is reasonable to suppose that Duluth may be as successful.

THE city of Canton, O., will soon be numbered among those which require the use of life saving fenders on all street cars, except trailers, operated within the city limits. Another name is added to our honor roll. Next!

THE Mayor of Atlanta, Ga., is reported as saying: "I consider the condition of Atlanta streets as a disgrace to us all. We have the dirtiest streets in the world." Why not invest a few hundred dollars in modern street sweeping machinery and remove this stigma?

AUGUSTA, Ga., has followed the good example of several other American cities and passed an ordinance requiring telephone, telegraph and electric light wires of all kinds, except the trolley and feed wires of electric car lines, to be placed under ground within the fire limits. The model city will have no wires above ground.

THE use of the chemical fire engine in fire departments has reduced the fire loss to a very large degree. This is due to two reasons: First, because a chemical engine is lighter and quicker in service; and second, because less damage is done by the use of chemicals than by water. It is a well known fact that water often damages more property than fire.

THE Bombay Government has set us a good example by sanctioning a scheme for the establishment in the Poona College of Science, a chair for the instruction of sanitary engineering. What is to hinder American colleges and universities establishing similar schools of instruction, thus raising the standard of efficiency in the administration of civic sanitation?

ROLLER bearing axles and rubber tires for the heavy fire apparatus employed in the various fire departments have greatly lessened the burdens of fire horses and firemen. The former have reduced, by almost fifty per cent, the pulling of the heavy apparatus, while the use of the latter has reduced the wear and tear upon the firemen. There are very few fire commissioners and chiefs who do not recommend the use of these great improvements.

It will be possible to make the city of the twentieth century more beautiful in all its construction on account of the multiplied forms in which cement can be used. The perfection of the modern street pavement would be impossible without the use of cement for the concrete base. For some time past the American cements have replaced foreign products. It will not be long before American cement manufacturers will control the market of the world.

THE use of the air brake upon a double truck street car saved the life the other day of a little boy who wandered onto the track in upper New York. This is only one of many instances occurring within the last six weeks where human life has been saved by the use of the air brake. It is gratifying to notice the increasing popularity of this life saving device, and also of the larger number of ordinances passed by cities requiring its use on all lines operating within city limits.

SOME cities continue to build the old fashioned draw or swing bridge. The cities of Chicago, Cleveland, New York, Boston and others are replacing some of their old swing bridges with modern bascule bridges. These are preferable for two reasons: First, because they leave the channel to be spanned entirely open; and second, because they are capable of more aesthetic treatment in their construction, and therefore less objectionable than the ugly swing bridge.

AMERICAN cities have the best trained fire departments in the world, and at the same time the poorest building regulations. If it were not for the inventive Yankee and courageous fireman the fire loss and death rate would be more appalling than it is. The ash heap and death rate, however, in the United States, as compared with the most advanced nations of the Eastern Hemisphere, are many times greater. These can be greatly diminished if our city fathers will pass more restrictive building regulations.

THE salvation of our Republic, as well as its continued usefulness, depends upon the educational influences brought to bear upon its cosmopolitan citizenship. Nowhere is this truer than in cities. For this reason we deprecate the policy of some cities to decrease the salaries of teachers in our public schools. Moreover, politics are often permitted to hamper and minimize the good work of our public school systems. The chief executives and legislatures of municipalities can do much to improve present conditions.

THE asphalt pavements of Cohoes, N. Y., have been more or less damaged by oil drippings from the Standard Oil Company's wagons as they have delivered oil about the city. For this reason an ordinance, which provides that every oil wagon shall have a pan to catch drippings of oil is being vigorously enforced. There are numerous nuisances of this kind which are permitted in American cities which would not be tolerated a day in English or European cities. If our city fathers were more observing as to the causes which damage our pavements less money would be needed for repairs.

THE municipal authorities of Columbus, Ohio, are making a commendable effort to remove the control of the Police Department from politics. It is now proposed to have a bi-partisan board appointed somewhat similar to that in vogue in Cincinnati, the appointment of the commission being made by the Governor. No plan, or system, or legislation, will insure a well governed police department. The personnel of its board and leading officers will determine the success or non-success of any department. The bi-partisan board has worked admirably in Cincinnati, but it has been a dismal failure in St. Louis.

THE recent fatalities in the use of antitoxine for diphtheria in St. Louis, Mo., and of vaccine in the city of Camden, N. J., have greatly alarmed the general public and not without some reason. Investigation which followed in Camden exonerated the Health Department and the physicians of that city who used vaccine, for it was shown that the deaths were caused by uncleanness in the homes and not by any impurities in the vaccine employed, as at first supposed. In the investigation it was clearly shown that tetanus resulted not from impure virus, but on account of dirt getting into the wound caused by the operation. An examination of the virus proves it to have been pure and free from anything which would have caused so direful a result. In the case of the use of antitoxine in St. Louis, however, it appears that the deaths were due to impure antitoxine manufactured by the Health Department. Some accidents are liable to happen in any well regulated department, and while the authorities in charge of the Health Department of St. Louis may be entirely guiltless of any negligence in the conduct of their affairs, nevertheless, it is true that too little money is appropriated for this important work, so that often the best equipment cannot be placed at the disposal of the authorities. Pittsburg's motto is a good one for all other cities to follow: "The best equipment obtainable is none too good to protect the lives of our citizens."

ASPHALT PLANT PUT OUT OF BUSINESS

THE city of St. Louis is considering an asphalt street repair bill, recently passed by the Municipal Assembly, which is of the utmost importance, not only to that, but other American municipalities. This bill, in effect, proposes to do away with the city's asphalt plant, and provides that the repairing and resurfacing of asphalt streets for the next ten years shall be done by contract. A copy of the records of the Street Commissioner's office shows the cost to the city of repairing asphalt streets from August, 1895, to April, 1901, to have been \$53,040.20. This shows the average yearly cost for keeping in repair 1,264,765 square feet of asphalt pavement to be \$10,608 per year.

The bill just passed proposes that the asphalt plant, which has been so useful in the past, shall be put out of business and that in addition the city shall pay \$18,000 a year for the next ten years, for the performance of the work which has been done in the past by the city at nearly half that sum. It seems to us an absurd kind of busi-

ness policy to virtually throw upon the junk heap a plant which has done such excellent service, and substitute for it, contract work; which does not claim to be any better, at an additional expense of \$8,000 per year.

There is no good reason for discontinuing the work of this excellent plant, but if it is to be, then the widest competition should be sought in order that the city might profit thereby. The St. Louis *Globe Democrat*, in an article of recent date says: "It is maintained that the bidding should not be restricted to any one concern from the wording of the bill, when there are St. Louis firms which can furnish better asphalt at cheaper rates than will be given by outside interests in whose favor legislation is being passed. A case in Erie, Pa., is cited in the communication now in the Commissioner's hands. It is asserted that a bill of a certain asphalt company was for \$2.05 per square yard, that of another for \$1.69, and that of a local Erie contractor for \$1.56. The specifications in this instance provided, it is claimed, for certain kinds of asphalt, or any other asphalt equal in quality or superior thereto."

It seems that the St. Louis specifications shut out competition by the omission of the clause, "Any other asphalt equal in quality or superior thereto." If St. Louis is to discard the efficient municipal asphalt repairing plant then it should be most careful to conserve the interests of the city and its taxpayers by incorporating in these specifications the provisions which would permit the widest competition. Any other course is to be condemned.

It would appear, however, from the information we have received from St. Louis, that Mayor Wells would be acting wisely, and in the best interests of all concerned, if he would veto the bill recently passed by the Municipal Assembly, for the reason that more asphalt can be furnished for use in the repair plant, which will make it very much cheaper for the city to do its own work than to let the work to contractors. There is no doubt that the interests of the taxpayers would be better served if the city plant were permitted to continue its efficient work. But if the city's plant is put out of business then the widest competition should be invited in order to secure the lowest contract price.



MECHANICAL VOTING IN RECENT ELECTIONS

THE voting machine has come to stay. It may be improved in minor particulars as time and experience dictate, but as perfected and in use to-day it stands complete and has given ample demonstration of its superiority over the Australian or any other system of voting. The fact that nearly a thousand voting machines were employed last month, in the various municipal and state elections in New York, Massachusetts and Rhode Island, with the most satisfactory results, affords sufficient evidence of the growing popularity and efficiency of this method of voting. The machine has been used in many cities of New York State for the past five years and with unvarying satisfaction. It is winning its way in public favor slowly but surely, and nearly a score of states have passed laws permitting its use.

The most valuable feature in the machine is its absolute accuracy in recording the result. The recent elections contributed the usual number of contested cases where the majorities were very small and the correctness of the returns were so uncertain that opposing parties in an election have appealed to the courts to determine the result. This means expense and delay. Where the machine is used such a contest is impossible, for the correctness of its returns cannot be questioned.

The voting machine was used in Greater New York for the first time at the recent election, in two different precincts and with the greatest satisfaction.

Quick returns from an election are only possible when the machine is used. In the city of Buffalo, which used over a hundred machines in the recent election, the returns from all the wards were filed in the City Hall within about thirty minutes from the close of the polls, but the result was known in much less time, as it was sent over the telephone from each voting precinct. While this is a factor which is not essential in the conduct of an election, yet it is one of the strong arguments why the voting machine should be universally adopted.

The New York *Evening Post*, in a recent editorial, called attention to what it styled, "one defect of machine voting," in which it questioned the secrecy of the ballot. It maintained that the slight click of the machine, when the lever was operated which voted a straight ticket, was perfectly audible to anyone near the voting booth, and for this reason any person desirous of such knowledge could tell whether a straight ticket was voted or not. The point is not well taken for the reason that the Australian system, now in use, is open to the same criticism, as the rapidity with which a man makes his ballot and comes out of the booth can be made to tell very clearly whether a man voted the straight or a split ticket. However, the machine can be worked so carefully that even the click referred to will not be audible outside of the booth.

There is no reasonable doubt that machine voting is easier for the voter because it is more simple than the blanket ballot. Another fact which should not be lost sight of is that repeating is impossible, and there can be no disfranchisement on account of defective ballots. "Splitting" is easier with the machine than with the blanket ballot. The fact that seventy cities and villages in New York State alone employed the voting machine with perfect satisfaction at the recent election is a good reason why it is safe for every city and village in the State of New York to adopt its use. Another point in its favor is that it will soon pay for itself, for it costs less for a city to vote with a machine than with the present Australian system.



MILLIONS IN STREET AND ROAD IMPROVEMENTS

THERE is no reform more widely discussed nor energetically pushed than that which involves the improvement of our streets and highways. During the past season millions of dollars have been expended for permanent pavements in cities, including stone, brick, wood, asphalt, bituminous macadam and ordinary macadam. At the same time millions have been expended in the improvement of our highways. The latter work has received greater attention during the past year than in any preceding period of five years.

Prominent in this extensive movement has been the National Good Roads Association, the Department of Public Roads' Inquiries of Washington, numerous state associations, and many local organizations. This work was inaugurated within the past decade, New Jersey leading in the work, and followed by Massachusetts, Connecticut, New York, Michigan, Pennsylvania and a score of other states which have more recently taken up the work.

Last spring, the Illinois Central Railway, under the auspices of the National Good Roads Association, started a "Good Roads Train" from New Orleans, working northward to Chicago, with frequent stops along the way for the purpose of constructing a sample road of a mile or less in length. The greatest enthusiasm was aroused along the route and it resulted in the formation of several state goods roads associations, as well as numberless county and town associations. Moreover, the work attracted national attention and resulted in the calling of the second International Good Roads Congress to meet at Buffalo during the Pan-American, the first one having been called a year previous at Port Huron, Mich., at the instance of State Senator Earle.

At the present time a second "Good Roads Train," consisting of ten cars, equipped with every device that is used to make better roads, is now en route through the South on a 6,000-mile itinerary, under the auspices of the Southern Railway and the National Good Roads Association, of which Mr. W. H. Moore is President. This train will make only ten stops, but these will be so carefully selected that the entire Southern section will have an opportunity to gather at different points and notice the methods by which the highways may be improved by the use of modern road machines. A full account of the first work of this train is given elsewhere in this number and we expect to follow its progress through the South and give our readers the benefit of its work.

In the days of our fathers the question of good roads received very little attention. Then it was a question of how much, not how good. The roughest specimen of roadway would answer the purpose. The advent of the bicycle, automobile and coaching parties has changed the situation entirely. To-day the demand is for better roads everywhere. The sentiment is growing very rapidly among

farmers, for they are beginning to learn that it costs less to transport their products over good roads than over poor ones and that it is a plain matter of business in more ways than one. It means the saving of many dollars to them in the course of a year.

In the construction of highways in several localities in the East and West, brick has been used, while others have used tar or bituminous macadam. The demand for better roads of this type is constantly increasing. A contract for three miles of bituminous macadam for the State road located near Cleveland has just been let. This kind of road, while less expensive than other permanent pavements, has come into prominent use in several cities during the past two or three years, and it is sure to become more popular.

While New Jersey, Massachusetts, Connecticut, New York, Michigan, Pennsylvania and other states will each expend hundreds of thousands of dollars during the next twelve months for the betterment of their highways, and while they are to be commended for their liberality in this direction, yet they are not up to the standard set by the Province of Ontario, Canada, which at the session of its Parliament last winter appropriated one million dollars for the betterment of its highways. When this little Canadian province is compared with our great country the contrast is less favorable, for the Department of Good Roads Inquiries, conducted by the Federal Government, received only \$20,000 last year. While the question of road improvements in this country is preëminently a State affair, nevertheless, it has an important national significance, and we believe that the Federal Government can ill afford to spend less than a million dollars a year upon this work. It should be the teacher of the whole country, and there are various ways in which this money could be expended profitably, without interfering with any state work. There has never been a time in the history of our country when it has been more essential that our state capitals should be connected by well constructed thoroughfares. These could be looked after by the Federal Government to the advantage of the whole country. We believe that the next Congress should place a larger appropriation at the disposal of the Department of Good Roads Inquiries and that it should adopt a more liberal policy for the furtherance of this general work.



—Anna Eliza Whitney, of Lancaster, Mass., has given \$10,000 for a public library to Bolton, Mass.

—Mayor Robert A. Smith, of St. Paul, Minn., has announced that he will be a candidate for another term at the spring election.

—The Harrisburg (Pa.) Board of Trade has engaged Mr. Warren H. Manning, of Boston, to prepare a plan of a system of parks for that city.

—Mr. John Cotton Dana, librarian of the city library of Springfield, Mass., has received a call to take charge of the public library at Newark, N. J.

—Mr. John E. McDonald, contractor of the Rapid Transit Subway in New York City, has just returned with his party from investigating the subways abroad.

—Mr. Charles W. Post, a citizen of Battle Creek, Mich., has presented a collection of valuable paintings to the city. They were purchased by him while abroad.

—Mr. H. C. Cox, City Marshal of the city of Prescott, Ariz., was shot and killed by Charles Levy on November 1, when the marshal attempted to arrest Levy on a trivial charge.

—Mr. Maurice Fitzmaurice, M. Inst. C. E., and at present Chief Engineer on the Assouan-Nile reservoir, has been made Chief Engineer of the London County Council to succeed Sir Alexander Binnie.

—Mr. Peter Reid, of the Reid & Barry Mills, has given the sum of \$50,000 to the city of Passaic, N. J., for a public library. The building will be in the foreign section of the city and is a memorial to Jane Watson Reid.

—Miss Helen Miller Gould has sent a library of 500 books to the public schools of Horse Cave, Ky. This is in return for the courtesy that was shown her when passing through the town on her way to Memphis about a year ago.

—Hon. A. A. Ames, Mayor of Minneapolis, Minn., recently offered a position as captain of police to Cole Younger, one of the notorious Younger brothers, ex-bandits, who have been paroled from the state prison. Younger has refused the offer.

—The magnificent organ that was in the Temple of Music at the Pan-American Exposition at Buffalo, N. Y., has been purchased by Mr. James N. Adam, of that city, and presented to the city by the purchaser. The organ will be placed in Convention Hall in the city.

—Mayor Gelinas, of St. Louis, Canada, lately set an example to the corporation employees by submitting to vaccination before them.

—Councilman Henry W. Grady, of Atlanta, Ga., has been endeavoring to have passed an ordinance requiring free services by the councilmen.

—Mayor Huston, of Lockport, N. Y., made an amusing blunder at his first marriage service. He married two couples, but confused the prospective brides and married them to the wrong grooms. As they were Italians they did not know the difference and the priest who performed the religious service undid the error of His Honor.

—At the third annual convention of the League of Colorado Municipalities, held at Colorado Springs, Col., November 14-15, Dr. J. R. Robinson, Mayor of Colorado Springs, Col., was re-elected president of the league; Mayor F. R. Wood, of Trinidad, Col., vice president, and Mayor Harlan Thomas, of Montclair, Col., secretary-treasurer.

—Mayor Tom L. Johnson, of Cleveland, O., is reported to be figuring on how he will land in the presidential chair in 1905. He thinks that the issues on which he was successful in Ohio are the issues on which the Democratic party must stand in the next presidential campaign, and their expounder would naturally be the candidate for the presidency.

—At the recent election in Mount Pleasant, N. Y., Reuben Roosa, employed as a teamster in building roads on the estate of John D. Rockefeller, was defeated for the office of Highway Commissioner. William Hutton, the Democratic nominee, beat him by twenty-four votes. Hutton has been Highway Commissioner for several years, although also a teamster, but did not attend to the roads to suit Mr. Rockefeller. The Rockefellers tried to defeat Hutton, but failed.

—Sir Thomas C. Dimsdale has been installed as the new Lord Mayor of London. Sir Thomas was knighted in 1894. He was born in 1849, and is a managing director in the banking house of Prescott, Dimsdale, Cave, Tugwell & Co. He was Sheriff of London in 1894, and has represented the city on the London County Council since 1895. He is a very wealthy man, and—a circumstance which is somewhat unusual with the Lord Mayors—is a favorite in London society.

—The need for cans in which to place refuse and papers that they may be kept from littering up the streets in Greenwich, Conn., appealed so strongly to the Rev. Josiah Strong, D. D., head of the League for Social Service, that he borrowed a wagon, loaded some garbage cans in it and drove about town distributing the cans in places that seemed to need them. The Village Improvement Association, whose president is the Reverend Doctor, has started a reform movement by which it hopes to beautify the town.

—The estate of Charles H. Hayden, of Boston, Mass., valued at \$700,000, has been divided almost entirely among charities. The Massachusetts General Hospital, the Children's Hospital on Huntington avenue, and the Massachusetts Charitable Eye and Ear Infirmary will receive \$50,000 each, and the Museum of Fine Arts \$100,000. The residue of the estate is divided equally among the Massachusetts Society for the Prevention of Cruelty to Animals, the New England Hospital for Women and Children, the Home for Aged Women, the Children's Mission, the Perkins Institute and Massachusetts School for the Blind, the Boston Home for Incur-

bles, and the Massachusetts Society for the Prevention of Cruelty to Children.

—Among the recently elected mayors are the following: Charles H. Gaus, Republican, Albany, N. Y.; Dr. S. L. Smith, Republican, Binghamton, N. Y.; Denis Mulvihill, Democrat, Bridgeport, Conn.; Erastus C. Knight, Republican, Buffalo, N. Y.; Joseph E. Nowery, Democrat, Camden, N. J.; D. E. Moore, Republican, Geneva, N. Y.; Mark M. Fagan, Republican, Jersey City, N. J.; Morris Block, Democrat, Kingston, N. Y.; Charles F. Grainger, Democrat, Louisville, Ky.; Jacob Wortman, Democrat, McMinnville, Ore.; George A. Viehmann, Democrat, New Brunswick, N. J.; J. D. Wilson, Republican, re-elected, Newburg, N. Y.; Seth Low, Republican-Fusion, New York, N. Y.; William Glasmann, Ogden, Utah; Otto Pfaff, Democrat, Oneida, N. Y.; Benjamin Baker, Republican, Oswego, N. Y.; John Hincliffe, Democrat, Paterson, N. J.; D. L. D. Granger, Democrat, re-elected, Providence, R. I.; Adolph J. Rodenbeck, Republican, Rochester, N. Y.; Ezra Thompson, Republican, Salt Lake City, Utah; Eugene E. Schmitz, Union-Labor, San Francisco, Cal.; Horace S. Van Voast, Republican, Schenectady, N. Y.; Jay B. Kline, Republican, Syracuse, N. Y.; Frank S. Katzenbach, Jr., Democrat, Trenton, N. J.; Daniel E. Conway, Democrat-Republican, Troy, N. Y.; Charles A. Talcott, Democrat, Utica, N. Y.; Michael J. Walsh, Democrat, Yonkers, N. Y.

A GROWING SOUTHERN CITY

BIRMINGHAM, Ala., Nov. 15, 1901.

Editor MUNICIPAL JOURNAL AND ENGINEER:

THERE is no city of the South that can show so great growth and progress for ten years as Birmingham. From a straggling village it has become a city of magnificent proportions and handsome buildings. The first modern ten-story building in this section of the country is now going up. It will cost \$350,000, and have as fine appointments as the skyscrapers of the North and East. A new city hall which cost \$200,000 is well on the way to completion, as are two large school buildings. A high school building to cost \$200,000 is the next thing on the tapis and that will be followed by other improvements. Contracts have been made or will be in a short time for a million dollars of street improvements.

Mayor W. M. Drennen, who is now serving his second term, is essentially a man of progress, and it is through his influence more than any other that the new city hall was erected and many of the street improvements ordered. He believes in the city branching out and it is said has a little leaning to the municipal ownership idea. He first came into prominence six years ago, while an alderman, in his fight against the water company. He forced a new contract, very much more liberal than the first, and has seen all along that the water was kept pure and plenty of it.

The city has just passed through one of the most exciting municipal struggles in the history of the State; that of a fight for a perpetual franchise over a large portion of the city by a street car company. The Birmingham Railway, Light and Power Company was the corporation making the contest. It has already all the franchises held in the city, every one of which is perpetual. Recently the company offered the regular price of \$100 a block for rights in perpetuity over seventy-eight blocks more. Led by Alderman George Ward, a strong opponent of perpetual franchises, there was a hard fight made by citizens to defeat the bill granting it. At the first vote the measure was defeated. Then the citizens, or many of them living in the territory over which it was expected the proposed lines would go, made a request of the council to reopen the matter, which was done, and acting on a suggestion made by *The Birmingham* that a franchise for ninety-nine years be asked for, a bill to this effect was introduced, but was rejected by the committee. The Birmingham Railway, Light and Power Company is a new organization recently formed by the consolidation of the Birmingham Railway and Electric Company, operating street car lines; the Consolidated Electric Light Company, furnishing electricity for lights of the city and power for the community, and the Birmingham Gas Company. It has a capital of ten million dollars with the bonds underwritten by the Old Colony Trust Company of Boston. Short-

ly before consolidation the railway company absorbed all the other lines of the city, so that, as the matter now stands, there is no competition for them in either the light, street railway or power field. They have the only street car lines, the only light and power plant and the only gas works.

The city is making just now its first serious effort to fight the dust evil. One thousand gallons of petroleum has been placed on the street to test its effectiveness as a dust layer. The oil was furnished by citizens and put on under the supervision of the street commissioner. Three blocks of a new street were spiked up and the oil applied while the dirt was turned over and before it got mashed down. There is much diversity of opinion concerning the effectiveness of the scheme, and it is pretty generally thought that so much will be required to do a good job that there will be no practical benefit.

One provision of the new constitution of the State, which the voters voted on at the last election to adopt, will be of great interest to all who have any idea of seeking Alabama franchises, and that is the one which prohibits any franchise being granted by any city for a term longer than thirty years. This is one reason the Birmingham Railway, Light and Power Company was so urgent in its efforts to get the franchises desired by them.

H. W. LAIRD.

BEST PAVEMENTS FOR GRADES

NORRISTOWN, Pa., Nov. 21, 1901.

Editor MUNICIPAL JOURNAL AND ENGINEER:

WILL you kindly give me some information concerning the construction of concrete pavements or roadways? I have been told of work done of this character in Paris, France. I would like information on this subject from American engineers, as follows:

(1) Construction; (2) quantities of material used; (3) durability; (4) cost of repairs. I was told that a permanent pavement of this sort was laid in Paris, the foundation being 1 part cement, 2 of sand and 5 of crushed stone, the surface being a mixture of 1 part of cement and 1 of sand.

We now have 3.52 miles of vitrified brick pavement; 1.42 miles of Belgian blocks, and 0.12 miles of asphalt blocks, out of a total of forty miles of opened streets, two-thirds of which are macadamized. Kindly give me your opinion of the best pavement for hills with a grade of over 5 per cent., and especially between seven per cent. and ten per cent. per 100 feet.

S. CAMERON CORSON, Borough Engineer.

It can be safely said that no city in Europe has such a pavement on a street roadway for regular public use. Two or three attempts have been made in the United States to make a cement concrete roadway pavement on the lines indicated, but they have proven too slippery and soon become brittle and otherwise not durable. That referred to in Paris is, no doubt, the foundations for pavements, because the European cities finish the concrete foundations, and with an even upper surface. Upon this foundation they place the wearing surface or pavement proper, either granite or other suitable stone blocks, sheet asphalt of various kinds or whatever material is deemed best for each locality or street.

As to the best pavements for hills, or grades, of 5 per cent. to 10 per cent., it is good practice to use asphalt, granite, brick, wood telford or any pavement desired, or light grades up to about five feet rise in one hundred feet of length, but for steeper grades, small sized, well shaped granite blocks, set, if possible, on a concrete foundation, will give a good foot-hold for horses. The joints between the blocks should be filled with a cement grout so as to prevent washing out of the blocks by heavy rain storms. Such a pavement on steep grades is durable and in the end economical.

For details of construction of granite, asphalt, brick, wood, telford and macadam pavements, it is wise to write for the official printed paving specifications of a dozen or more cities of the United States. For those of large cities, address the Engineer of the Street Department, Board of Public Works; for smaller cities, write to the City Engineer.—[ENGINEERING EDITOR.]

WATER AND LIGHT FOR SMALL TOWNS

SALAMANCA, N. J., Nov. 20, 1901.

Editor MUNICIPAL JOURNAL AND ENGINEER:

ENCLOSED please find my check for \$3.00 for renewal of my subscription.

I would like you to send me what you have in regard to water and electric lights for villages of about 5,000 population. We are soon to make a new contract with our water and electric light companies and we would like to know what other towns of our size are paying.

H. A. OSTRANDER.

LIGHTING STATISTICS.

	Population.	No. of lights.	Candle power.	No. public acres.	* Hours lighted.	Price per arc, com-mercial, per year.	Price per arc, com-mercial, per month.	Power used.	Cost fuel per ton.
Amherst, Mass.	5,000	45	...	31		\$85.00		steam	\$4.25
Bellefontaine, O.	6,649	245	2,000	34	3,347	80.00	\$4.67	steam	2.20
Bloomsburg, Pa.	6,170	180	2,000	67	3,300		6.00	steam	1.70
Bucyrus, O.	6,560	80	2,000	94		100.00	7.8	steam	2.10
Canton, Ill.	6,564	175	1,200	125	2,221	48.00	4.50	steam	1.37
Carlinville, Ill.	4,501	75	...	48	†	72.50	7.50	steam	
Catskill, N. Y.	5,484	80	1,200	56	4,000	38.00	8.00	steam	3.50
Conshohocken, Pa.	5,762	90	2,000	50	4,000	87.50	...	water	2.55
Franklin, N. H.	5,200	75	1,200	61		50.00	...	steam	
Frostburg, Md.	6,000	100	2,000	45	†	72.00	...	steam	1.60
Ilion, N. Y.	5,138	150	2,000	168	4,000	87.00	6.00	steam & water	3.00
Macomb, Ill.	5,375	50	1,200	21	2,700	72.00	6.00	steam	2.00
Malone, N. Y.	5,935	75	2,000	72	†	44.50	5.00	water	
Murphysboro, Ill.	6,463	75	...	50	†	120.00	6.40	steam	1.50
New Philadelphia, O.	6,213	135	2,000	87		75.00	5.00	steam	1.00
Norwalk, Conn.	6,125	295	1,200	92	3,000	74.00	...	steam	3.50
Paris, Ill.	6,105	...	...	...	...	5.00	steam		1.25
Putnam, Conn.	6,667	75	1,200	50	1,800	73.00	6.00	steam	4.75
Ravenna, O.	4,000	80	2,000	60	2,200	72.50	...	steam	2.00
Sewickley, Pa.	4,000	100	...	54	†	70.00	5.83	steam	1.00
Sidney, O.	5,688	120	...	100	†	75.00	4.00	steam	
Sterling, Ill.	6,309	70	2,000	8	†	80.00	6.50	steam & water	2.80
Towanda, Pa.	4,700	90	2,000	40	*	60.00	5.00	steam	1.50
Washington, O.	5,151	175	1,200	101	3,600	65.00	...	steam	2.15
Woodbury, N. J.	6,000	48	1,200	48	2,600	80.00	...	steam	2.95

* All dark hours or moonlight or limited schedule.

† All night and every night.

WATER STATISTICS.

Population.	Franchise.	Number public hydrants.	Cost per hydrant per year to city.	Fixture rates, dollars, per year.			Meter rates.		
				Family.	Water closet.	Bath tub.	Hose and carriage.	Hose.	Per 1,000 gals., cents.
Archbold, Pa.	5,396	...	8.00	4.00	4.00	...	2.00	6.00	20 20 Minimum.
Cadillac, Mich.	5,997	30 yr.	75	\$46.66	6.00	2.25	2.50	3.50	40 15 Maximum.
Canal Dover, O.	5,422	city	78	...	7.00	2.00	3.00	5.00	20 20
Chicago Heights, Ill.	5,100	city	72	...	9.00	...	...	3.00	10 8
Concord, Mass.	5,652	city	130	...	6.00	5.00	4.00	5.00	30 30
Conshohocken, Pa.	5,762	20 yr.	54	15.75	7.00	2.00	3.00	3.00	15 15
De Kalb, Ill.	5,904	city	112	...	6.00	3.00	2.00	2.00	40 20
Easthampton, Mass.	5,603	city	90	...	6.00	2.00	2.00	2.00	15 Sl.
Galena, Ill.	5,005	10 yr.	72	...	8.25	2.50	3.50	3.00	50 15
Greensburg, Ind.	5,934	20 yr.	125	...	8.25	3.00	3.50	3.00	7.50 35 15
Greenville, O.	5,501	city	106	...	4.00	2.00	3.00	1.50 5.00	7 8 8
Hanover, Pa.	5,302	...	36	5.00	6.00	2.00	2.00	3.00	13 10
Harvey, Ill.	5,395	30 yr.	127	31.10	8.00	3.00	3.00	3.00	5 20 8
Hingham, Mass.	5,059	...	204	11.00	8.00	4.00	4.00	5.00 5.00	...
Ilion, N. Y.	5,138	city	113	...	6.00	3.00	3.00	3.00	3.00 40
Monroe, Mich.	5,043	30 yr.	137	41.75	7.00	2.00	3.50	2.00	6.50 30 Sp.
Mt. Vernon, Ind.	5,132	...	77	...	8.00	3.00	4.00	2.00	...
Orange, Mass.	5,520	city	97	...	7.00	4.00	3.50	3.00	5.00 10 25 Sl.
Owego, N. Y.	5,039	...	65	...	7.00	5.00	4.00	3.00	8.00 30 30
Painesville, O.	5,024	city	70	...	8.00	4.00	4.00	5.00	...
Pana, Ill.	5,530	city	85	...	6.00	2.00	2.00	2.00	3.00 35 10
Troy, O.	5,881	city	110	...	5.00	2.00	2.50	3.00	...
Wellesley, Mass.	5,072	city	210	...	meter system in use.	2.00	3.00	6 38 25	
Westboro, Mass.	5,400	city	89	...	5.00	4.00	3.00	3.00	4.00 30 5 Sp.
West Haven, Conn.	5,247	...	30	...	6.00	3.00	3.00	6.00	...

In response to the above we have compiled the desired information from our files and other sources which will have a value to many other of our readers. It will be found in the following tables.—[Editor.]

ANOTHER CITY CLERK'S METHOD OF INDEXING

PAWTUCKET, R. I., NOVEMBER 21, 1901.

Editor MUNICIPAL JOURNAL AND ENGINEER:

THE interchange of views on the various methods of indexing in use in the offices of the city clerks must bear good results. As a rule city clerks have little time to visit other offices and the result is that methods in vogue when they entered upon their official duties

are continued. Even when good systems are presented to them for their consideration they are reticent about adopting them; for, unless they re-index their entire set of records, they will have at least two systems. This is sure to cause confusion. To commence at the incorporation of the town, or city, and index the council records is quite an undertaking, and few clerks care to enter upon such a task, especially in cities where the clerks are changed by every political tide. It is the only proper way to make an index, however, and the clerk who will do it will have at least the satisfaction that his council records will be available not only to the clerical force in his office, but to the public having occasion to consult them.

In indexing council records the greatest difficulty lies in the fact that the index must be an index to the council journal and should be an index to the files where the original papers are kept. To keep an index to the journal and another index to the files is unsatisfactory. To keep an index to both in the front or back of each journal necessitates looking through more than one index unless the exact date is known. The clerk may know just what book to look in, but if the city has been incorporated for a number of years, even the clerk cannot keep run of the dates and must spend more or less time in looking up matters, while a stranger to the office would have quite a task to find what he desired. I am now at work on a general index for the records of the City Council of this city.

The city was incorporated in 1886 and I intend to index every meeting of the City Council held since the incorporation. The early records were written in large journals and some of them contain records covering three or more years. Since 1896 the records have been typewritten and are bound with the McMillan binder and the records for each year make a separate volume. A card index is kept during the year. At the close of the year the matter contained on the cards is typewritten on sheets and bound in the back of the journal. This gives me a strictly alphabetical index during the current year and also a strictly alphabetical index for each volume. This cannot be obtained if the index is made up in the journal from meeting to meeting.

At the end of the year the cards are transferred to a card index cabinet in alphabetical order. When this work is completed I will have a strictly alphabetical index for each journal and a general card index for the council records from the incorporation of the city down to date.

The filing of the original papers is done under the numerical system. Every title has a number. The card enclosed relating to Whitford avenue shows the file number to be 176. Every paper relating to Whitford avenue will be filed in the envelope numbered 176. Thus the entire history of a street can be obtained in an instant. Under 600 some titles various file numbers will be found as will be shown on the card for the Sewer Department. The papers are filed under the street title number and in the cross card for

Year 1901 Journal No. 12

File No.	Whitford Avenue	Page
178	Petition to layout	9
	Commissioners appointed	11
	Commissioners report received	34
	Notice to abutters ordered	35
	Report accepted	85
	\$800 for land damages	68-74
	\$5000 for improvement	83-92

MUNICIPAL JOURNAL AND ENGINEER

Sewer Department the file numbers also appear. Where more than one card is used in a year under a title the card is numbered in the

File No.	Year 1901 Journal No. 12 Sewer Department	5 Page
34	Carson st. \$1100	22-34
178	Filter fields \$4000	37-39
377	Construction account \$8000	35-46
87	Main st (Bailey to Jackson) \$600	52-58
478	Whitman st. \$1100	58-68
123	Order Board of Health estates to connect	110

upper right hand corner, the Sewer Department card being the fifth card under that title used this year.

SAMUEL H. ROBERTS, *City Clerk.*

FIRE DEPARTMENT SALARIES

WATERTOWN, N. Y., October 3, 1901.

Editor MUNICIPAL JOURNAL AND ENGINEER:

Will you kindly publish in your valuable paper a list of the salaries and men in the fire departments of the different cities in the United States.

F. MONNON, *Chief, Fire Department.*

According to the above request, the following list was compiled and we take pleasure in printing it for the benefit of the writer and others that may be interested in the same subject:—[EDITOR.

Cities.	Chiefs.	Captains.	Lieuts.	Engineers.	Firemen.
New York, N. Y.	\$500	\$180	\$150	\$133	\$83-116
Chicago, Ill.	500	120-137	100-107	87-115	70-105
St. Louis, Mo.	333	100	95	100	90
Baltimore, Md.	116	75-91	83	91	66-75
Boston, Mass.	291	133	116	108	100
Cincinnati, O.	250	105	93	100	90
Buffalo, N. Y.	250	91	79	83	75
Cleveland, O.	208	95	85	95	80
Pittsburg, Pa.	250	86	75	85	75
Detroit, Mich.	250	96	83	96	75
Milwaukee, Wis.	300	100	91	100	80-166
Minneapolis, Minn.	250	82-85	72-75	80-82	70-72
Rochester, N. Y.	223	95	82	83	75
Providence, R. I.	166	3.50 a day	3.15 a day	3.25 a day	2-3 a day
Omaha, Neb.	250	80	75	85	50-70
Indianapolis, Ind.	125	75	2.25 a day	75	2.25 a day
Kansas City, Mo.	202	71	none	71	60
St. Paul, Minn.	250	78-84	70-74	78-80	60-69
Denver, Col.	208	100	90	100	85
Toledo, O.	187	75	none	75	66
Allegheny, Pa.	166	80	75	85	75
Columbus, O.	166	85	80	85	75
Paterson, N. J.	150	83	none	81	79
Grand Rapids, Mich.	166	76	65	83	62
Nashville, Tenn.	150	75	70	75	67
Dayton, O.	208	70	none	77	66
Des Moines, Ia.	100	65	60	none	60
Savannah, Ga.	166	70	60	83	50-60
Lincoln, Neb.	100	65-70	60	70	60
Peoria, Ill.	116	70	none	none	65
Seattle, Wash.	100	65	62	65	60
Spokane, Wash.	100	75	67	75	67
Topeka, Kan.	125	68	60	60	60
Davenport, Ia.	95	65	none	none	60
Sioux City, Ia.	100	60	none	none	50
Macon, Ga.	125	60	none	75	50-60
The following have yearly salaries (1898):					
Atlanta, Ga.	\$4,000	1,200		1,080	780
Albany, N. Y.	3,000	none	none	1,080	720
Duluth, Minn.	2,500	840	780	900	660-720
Dallas, Tex.	1,200	720	none	840	600
Evansville, Ind.	1,800	780-816.40	none	876.20-839	624-764
Charleston, S. C.	1,500	840	none	900	414
Fall River, Mass.	1,500	1,050	none	1,200	900
Hartford, Conn.	2,500	750			750
Jersey City, N. J.	2,500	1,200		1,100	950-1,000
Louisville, Ky.	2,500	1,003.75		1,080	821.25-912.50
Lawrence, Mass.	1,300	960			910
Minneapolis, Minn.	3,000	1,020-990	900-870	984-960	870
Memphis, Tenn.	1,800	1,320		1,200	900
New Haven, Conn.	2,500	1,000-1,200	900	1,200-1,250	750-900
Syracuse, N. Y.	2,000	960		900	800
Saginaw, Mich.	1,400	720		700	600
Toledo, O.	2,250	900		900	800
Erie, Pa.	1,300			900	720
Elmira, N. Y.	1,500	900			720
Lowell, Mass.	2,000	1,090		1,002	1,001
New Orleans, La.	3,000	900, 840, 720		780-900	660-780
Oakland, Cal.	1,800	900		1,200	900
Pittsburg, Pa.	3,000	1,033.32	900	1,011.10	900-933.32
Portland, Ore.	2,000			1,200	720-840
Salt Lake City, Utah.	1,500	1,000	960	960	900
San Francisco, Cal.	5,000			1,680	1,080
Somerville, Mass.	1,800	1,050	1,050	1,140	1,000-720
Seattle, Wash.	1,500	960	900	960	780-810
Tacoma, Wash.	1,200	780	720	840	720-660
Worcester, Mass.	2,000	960	900	960	900-840
Washington, D. C.	2,000	1,000		1,000	800-840
Cambridge, Mass.	1,800	1,080	1,020	1,020	920-1,020

MILLIONS FOR IMPROVEMENTS IN ST. LOUIS

EARLY next year a small army of laborers—not less than 5,000 brawny men—will be employed by the city of St. Louis to push along toward rapid completion improvements which will aggregate millions of dollars. This vast sum of money will be expended for the reconstruction of nearly fifty miles of streets and for the extension of sixty-two miles of the present sewer system. All this work must be completed prior to May 1, 1903. For the year just closed \$1,000,000 has been expended for street improvements and \$500,000 for sewer work. Of the total sum to be disbursed during the next eighteen months, \$2,500,000 will be devoted to the improvements of the streets and \$2,000,000 devoted to sanitary purposes. Besides these improvements millions will be expended for other purposes, making an aggregate of \$10,000,000 to be disbursed before May 1, 1903, the date set for opening the gates of the World's Fair.

Plans and specifications have already been drawn which call for the laying of sixty miles of water mains, and for a large portion of the street and sanitary improvements. Work on the new city hospital, which is to cost when completed not less than \$1,000,000, is progressing rapidly. Contracts have been awarded for the purchase and installation of five new pumping engines for the high and low pressure service pumping stations, the aggregate cost of which will amount to nearly \$700,000.

The problem of a supply of potable water to the 600,000 inhabitants, to hundreds of large manufacturers and to the millions of visitors who will find their way to St. Louis in 1903, is one which involves serious consideration. Many citizens of St. Louis hold to the belief that the impurities of the Mississippi river water are largely increased by the discharge of the sewage of Chicago into the Mississippi through the Illinois river. For several months a Commission of hydraulic engineers has been at work upon this phase of the question, and will submit a report early in the new year to Mayor Rolla Wells, as to what, in its judgment, will be the best method for obtaining a supply of pure, wholesome water. Three propositions will be treated in this report: (1) To filter the Mississippi river water; (2) To change the source of supply and take the water from the Missouri river twenty miles away and filter it; (3) To procure water by gravitation through five counties from the Meramec river. It is the purpose of the municipal officials, which is supplemented by a strong public feeling, to obtain a clear, pure water supply as soon as possible at any cost. It has been estimated that a plant of sufficient capacity to purify water from the Mississippi would cost between \$2,500,000 and \$3,500,000. It is determined that some project will be commenced immediately after the submission of the report.

The members of the Commission are Mr. Allen Hazen, of New York; Mr. Charles Y. Wisner, of Detroit, Mich., and Mr. Benetze Williams, of Chicago.

Many interesting and difficult engineering features will be involved in the progress of the improvements already proposed. For instance, one large sewer will be drilled through the stone base of the bank adjacent to the Mississippi. The sewer will be over a half mile long and will require ten months for its completion, as only a limited number of men can be occupied simultaneously in its construction. Another will be the Big Mill Creek sewer, which is said to be the second largest in the world, rivaling the noted sewers of Paris. It will be twenty-four feet in diameter, large enough to permit two cars to pass each other, or the passage of a wagon loaded and stacked high with hay. Another engineering feat of no small importance will be that of elevating a line of 24-inch water main to the surface of the street, in order to afford right of way accommodations for the new belt line that is being constructed around the city. Heavy mains are to be raised from the ditch and laid across railway viaducts.

Besides these extensive improvements the city will be thoroughly renovated, streets cleaned and everything within its corporate limits put in the most perfect order. The municipal improvements, together with the vast amount of work which will be performed in connection with the erection of the World's Fair buildings, will make St. Louis, in all probability, the busiest community in the United States for the next year and a half.

SOME OF THE NEWLY ELECTED MAYORS



SETH LOW,
New York, N. Y.

THE municipal elections of the past month are more than of passing interest. The attention of the world centered upon the contest in New York, where the combined reform forces were arrayed against Tammany Hall. The issues were purely of a local character, but of vital importance. The campaign and its results are now ancient history. The public is now only concerned about what Mr. Low will do and how he will improve his opportunities. Never in the history of municipal affairs of New York City has the reform element obtained such complete control of the city government.

Mr. Low's biography is too well known to need repetition, but everyone is interested in the platform which he has announced. To express it in the briefest way, he means to give New York a thorough business administration. "For more than twenty years," said James H. Canfield, in a recent number of the *Review of Reviews*, "Mr. Low has stood squarely and insistently, and unselfishly and fearlessly, for this theory of business principles and not partisan methods in local affairs. He has been its most conspicuous advocate, he has been its very incarnation, and for four years he put all this into practice in a remarkably successful manner. It is scarcely too much to assert that the public affairs of Brooklyn during his mayoralty became as though his private business, and as far as possible were administered upon precisely the same basis and by the same methods as would direct his conduct of private affairs. He tried to save money for the people precisely as he would have tried to make money for himself." The citizens of New York expect him to maintain the same standards which were so faithfully carried out in his rule of Brooklyn.

Next in importance was the election occurring in Buffalo. Here for many years the independent element, about five thousand in number, has maintained a balance of power, which has always insured the nomination of the highest type of citizen by each of the old parties. Conrad Deihl, a Democrat, has held the office for four years, but the pendulum swung in favor of the Republican nominee, the Hon. Erastus C. Knight, Comptroller of New York State. Previous to his election as State Comptroller, Mr. Knight held the same office in the city administration of Buffalo. He now resigns his state office to accept that of the chief executive of his home city. Mr. Knight was born in Buffalo and has lived there all his life. He is looked upon by his fellow citizens as a man of sterling integrity and large ability. His administration cannot fail to give the utmost satisfaction.

Other important New York municipal elections were those occurring in the cities of the second class—Rochester, Syracuse, Utica, Albany and Troy. In the city of Rochester there was a warm contest between Assemblyman Adolph J. Rodenbeck, Republican, and ex-Mayor Warner, Democrat. Mr. Rodenbeck was elected and will succeed a Republican, the Hon. F. J. Carnahan, who has given the city an admirable administration. Mr. Rodenbeck was born in Rochester thirty-nine years ago and has lived in that city all his life. He is a university graduate, a lawyer, having been admitted to the bar in 1887, in Brooklyn, N. Y. He is thoroughly familiar with municipal affairs, and it is expected that he will give an excellent administration.

Perhaps the most interesting campaign outside of the city of New York was that which was waged in Syracuse, where the Hon. James K. McGuire was running for a fourth term. Syracuse has been for years a Republican stronghold, but for three previous successive terms Mr. McGuire, a Democrat, succeeded in obtaining handsome majorities. Contrary to expectations he stood for a fourth term and was defeated by Hon. Jay B. Kline.

Hon. Daniel E. Conway was re-elected Mayor on the Fusion ticket in Troy. Mr. Conway was elected for a first term two years ago by a small majority, which was increased at the recent election. The administration of his first term, although beset with many difficulties and requiring the exercise of unusual judgment because of the carrying out of important municipal improvements, has been very satisfactory and undoubtedly was the reason for his renomination and re-election. Mr. Conway is a native of Troy and is a young man of exceptional ability and energy. His second term is sure to be even more useful.

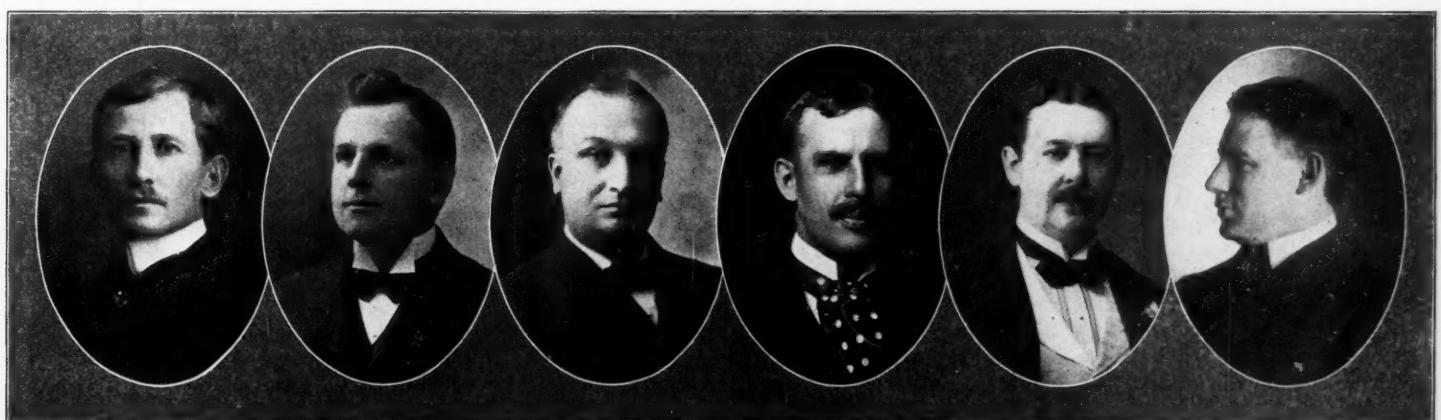
Mr. Charles H. Gaus was elected Mayor of Albany, where the campaign was conducted on strictly party lines.

Mr. Charles A. Talcott, a prominent Democrat of Utica, was elected Mayor. Mr. Talcott was born in Oswego, N. Y., but has lived in Utica since 1866. He is a Princeton graduate, an able lawyer, and in several capacities has served his city since '86 under different mayoralty administrations. He is a man of wide activities and great public spiritedness. The expectations of his friends for a most thorough and successful administration of the city affairs will undoubtedly be realized.

Mr. Horace S. Van Voast is one of the youngest Mayor-elects of the State and will doubtless administer the affairs of his city,



ERASTUS C. KNIGHT,
Buffalo, N. Y.



ADOLPH J. RODENBECK,
Rochester, N. Y.

DANIEL E. CONWAY,
Troy, N. Y.

CHARLES A. TALCOTT,
Utica, N. Y.

HORACE S. VAN VOAST. GEORGE A. VIEHMANN,
Schenectady, N. Y. New Brunswick, N. J.

F. S. KATZENBACH, JR.,
Trenton, N. J.

MUNICIPAL JOURNAL AND ENGINEER

Schenectady, with the utmost satisfaction. He was born in 1869 and began his public career as Recorder in 1900.

In the mayoralty elections outside of New York State, there were many of considerable interest. George A. Viehmann, Esq., was elected Mayor of New Brunswick, N. J., on the Democratic ticket. He is a graduate of Rutgers College, in the class of '86, of Columbia Law School in '91, and has been a prominent attorney of his own town for several years, practicing law in both New Jersey and New York. He stood for a progressive rather than a conservative administration of city affairs and, as a result, things are likely to move forward in that city during his administration.

Mr. Frank S. Katzenbach, Jr., a prominent attorney of Trenton, N. J., was elected Mayor of that city on the Democratic ticket. He is a young man, graduate of Princeton in '89, also of the Columbia Law School, and for several years has served his ward in the Common Council as president of that body, which is officially known as "Alderman-at-Large." For the next two years the city of Trenton will undoubtedly have a progressive administration.

The city of Bridgeport, Conn., with a population of 75,000, one of the typical American cities, elected as its chief executive, Mr. Denis Mulvihill, who has been called by the newspapers the "Stoker Mayor." For twenty-eight years he has shovelled coal into the furnaces of one of the prominent manufactories in that city. He comes to this important office with no experience in official life, besides his service for several terms in the City Council. His opportunities for an education have been limited, but he has a sterling integrity which has long been recognized by his fellow citizens. His honesty is unquestioned. While he was nominated by the Democratic

party, it is said that many independent Republicans, including some of the ex-Mayors, helped to elect him. His election seems to have come about through the desire to rebuke those who had been in power for several years. His administration will most assuredly be an honest one, and it is expected by his friends it will be a wise one. One thing is already assured, namely, that there will be no unnecessary expenditures, either for salaries or public improvements, he having learned the value of a dollar by hard labor. He will be exceptionally jealous of any extravagant expenditures. He is one of the people and is likely to give a people's administration.

Another surprise, in the municipal elections, occurred in San Francisco. Mr. Eugene E. Schmitz, the labor candidate, whose hardest work has been in wielding a musician's baton, was elected Mayor. His nomination grew out of the recent labor troubles in San Francisco, and his administration, it is expected, will favor the strikers. In contrast to the policy of the "Stoker Mayor," that of San Francisco is likely to be decidedly liberal in so far as the expenditure of public moneys for public improvements is concerned, for during the campaign the labor leaders announced high wages for the laboring man and the expenditure of millions of dollars for public improvements as a part of their programme. Mr. Schmitz is not a labor agitator, and only consented to become the candidate of the Union Labor party because he felt that the old parties were boss-ridden. He declares that he owes his election to the support of independent Republicans and Democrats, and, for this reason, those who know him best claim that he will not carry out many of the absurd ideas in regard to the conduct of city affairs which were announced by the Union Labor party during the campaign.

FREE STREET CAR TRANSPORTATION

By Tom L. Johnson*

THE ideal system of municipal ownership of street railways would give free transportation to everybody. At first blush this may seem an extreme step, but that is because we have not been used to looking at the matter in the right light. In every great office building a system that is in many respects the counterpart of the one I suggest is maintained in the elevator service. All comers are carried in the elevators free of charge. No one dreams of collecting a toll or of insisting that, in the absence of such a toll, the person wishing to be sent to the upper floors use the stairs. The maintenance of the elevator service falls upon the tenants of the building, for it is included when the rent schedules are fixed. The tenants in turn pass it along to their customers and clients. Every one who pays a lawyer's bill has the elevator service charged somewhere though he may not find it set out in detail. The burden scattered among all the tenants and their clients is so minute, and the results in comfort are so decided, that no one dreams of abridging the service even though by so doing the rents might be somewhat lowered.

Our free streets and roads form another instructive precedent for free street car service. There was a time when every road leading into and out of our cities had a tollgate. Experience showed the restrictive influence of such institutions, and to-day it is only the backward and unprogressive community that maintains toll roads. How recent has been the change in this direction is made manifest by the fact that it is only a few years since the big bridge from New York to Brooklyn was made free to foot passengers.

It may be asserted that a system of free street-car transportation would involve a hardship on the tax-paying residents, in that strangers coming to the city would be given privileges for which they did not pay. In times of great public gatherings, such as conventions, the strangers might even crowd off some of the regular taxpayers. This objection loses its force when it is remembered that every stranger must spend money for food and lodging, and that a great gathering invariably means a considerable increase in business for merchants, hotel-keepers and citizens generally. The money left in the city by the strangers would more than pay for the free street-car rides. In the big office buildings where the free elevator service exists the tenants do not demand that the privilege of riding be restricted to themselves. They realize that persons who come into the building

bring them business and aid them in making money. It is to their interest to make the transportation of these people up and down as easy and comfortable as possible. Out of consideration for its best business interests no progressive concern will take offices in a building where there is no elevator service.

In case, however, in spite of its manifest advantages, the system of free transportation should be deemed too radical for immediate acceptance, the next best plan would be the operation of the roads by the city, and the imposition of a fare as low as is consistent with the expense of management, and maintenance. The lower the fare the better for all concerned. Such a system would have many advantages over the system of private ownership for profit besides that of securing lower fares. It would eliminate the most prolific source of political corruption in our municipal government. Take away the private control of public utilities and there would be an end to much tax dodging and to much bribery of public servants. This bribery comes in various forms. Often it is the shape of the direct payment of money to secure certain privileges and immunities. Often it is in the shape of political preferment made possible through the control of the machine by the corporations, which always remain in close and responsive touch with machine workers. The gain in the direction of a higher moral tone would in itself be sufficient compensation for adopting municipal ownership even if all the other advantages fell away.

Pending municipal ownership in one form or another, every city should henceforth be most careful, in awarding franchises for public utilities, to restrict the term of years the franchise has to live, and to provide very definitely for the acquisition of the rights by the city. All street-car franchise rights should be based on three-cent fares, and it should be explicitly stipulated that the streets turned over must remain "free territory." By this I mean that no city government having the rights and interests of the citizen at heart will grant to any street-car company, henceforth, the privilege of operating over any street to the exclusion of any other line. The ideal way for the city, under the system of private ownership, to grant franchises, would be simply for the operation of the road, the city itself building and maintaining the tracks and holding them in ownership. If, however, this cannot be done, then the corporation seeking a franchise should be required to give the use of its tracks to all comers on the payment of a proper compensation for such use.

* From an article in the *Saturday Evening Post* of November 9, 1901, by the Mayor of Cleveland, O.

ODD THINGS RELATING TO MUNICIPALITIES

**How One Drink Caused a Mayor to Lose His Office—Proposed Municipal Restaurants—Aldermen Object to Beer—
A Unique Michigan Town—Anti-Long Skirt Crusade**

PUBLIC CLOCKS FOR STREETS.—Another one of London's traditions may soon be shattered. It is suggested that a public clock, worked by electricity and corrected hourly from Greenwich by means of the electric current, shall be placed in each of the principal streets of the city. At night they will be lighted by electricity. This will do away with the time-honored custom of asking a policeman for the time.

MUNICIPAL "RUSSIAN BATH."—The Leeds (Eng.) Corporation Bath Committee has just opened another bath to the public and this one is of the "Russian" kind. The accommodations include a hot room, warm lavatories, shampooing room, cooling room and dressing places for fifty persons. A temperature of from 105° to 110° Fahrenheit is obtained by injecting showers of steam into the room. The admission to the bath is eight cents.

AUTOMATIC LAMPLIGHTING.—There was a talk recently of a Parisian lamplighter who made his rounds on a bicycle, which was accounted a great mark of progress. But the town of Zurich has gone one better. They have just installed in that enterprising municipality a hundred new street lamps which are lighted and extinguished automatically by clockwork at any desired hour. It is sufficient to set the clock from time to time as you would set an ordinary alarm, and both the lighting and extinction of the new lamps take place without the intervention of any visible lamplighter.

MUNICIPAL RESTAURANTS.—Ten years ago there was an agitation started in New York City in favor of municipal restaurants. Lately this idea has been revived to have the city take hold of the matter. One of those who are in favor of these restaurants is the Rev. William S. Rainsford, rector of St. George's Church. He brought the subject before the public some twelve years ago, and is convinced that it would pay the city to run them. He says that they would be a great boon to wage-earners by enabling them to get clean, wholesome and well-cooked food at prices that they could afford. Municipal restaurants would not savor in any way of paternalism and would be popular.

ALDERMEN OBJECT TO BEER.—In looking over the accounts at the meeting of the market, license and health committee of Winnipeg, Canada, an item for beer supplied to the small-pox quarantine appeared. Port wine is supplied, but the item for beer caught the eye of one alderman and he objected. When the medical officer was asked about this, he replied that he supposed the beer was for the attendants of the patients. This was like a red flag to a bull, and the ire of the aldermen immediately flamed up. As the doctor in the hospital received \$15 a day for his services it was considered unnecessary for the city to pay for his drinks. Hereafter all stimulants for the quarantine must not be purchased except by order of the health officer.

BATHS IN PUBLIC SCHOOLS.—For the future it has been decided that the public schools of Boston, Mass., are to be supplied with well-appointed bathrooms. Whenever a child appears at a school and his appearance is not what it should be as regards cleanliness of person, it will be the duty of the teacher to take him to the bathroom and give him a lesson in hygiene. And he will not be allowed to enter the class-room until he is in proper condition. It is to be hoped that this action will cause those subject to the cleansing to insist on the work being done at home before coming to the school, for children are naturally sensitive to being classed among the unclean. In one school, where the bathrooms have been in operation for some time, it has been found that the scholars come to school in a much cleaner condition than before, and the atmosphere of the class-rooms is much better than was formerly the case.

ONE DRINK DID IT.—The city of Ottawa, Canada, is without a mayor. The former incumbent of that office was detected not long

since in the act of committing a breach of the license law in purchasing liquor after the statutory hours of closing. When arrested and charged with the offense in the Police Court, His Honor did not deny the charge, but pleaded guilty, to keep out of court some friends that he had been entertaining. In his efforts to carry out civic reforms the Mayor fell a victim to the cunning of his enemies who have been endeavoring to trap him. There is a clause in the license law by which, if any member of any municipality is convicted of having knowingly committed an offense under the act, he shall thereby forfeit his seat and shall be disqualified for two years thereafter. It is said that the plot for the undoing of the mayor was concocted in the police department, because his defeat at the coming elections was despaired of. A temporary mayor has been appointed by the City Council to serve until the election in January.

NO LONG SKIRTS.—Mr. Henry Meigs, one of the Health Commissioners of Bayonne, N. J., has startled that dignified body by declaring his intention of having an ordinance passed forbidding the women of the town to wear long skirts. The streets of Bayonne are not as clean as they might be, and this is one of the ways Mr. Meigs hopes to remedy the defect. Any woman who wears a skirt longer than the Health Board allows is to be taken before the board and fined. Mr. Meigs' idea is that, as people are fined for spitting in the cars they should be for spreading disease in other ways, and contagion will be spread very readily by the skirts sweeping up the spittle and carrying it into the houses. With the fact staring him in the face that the women would be his everlasting enemies should this ordinance be passed, Mr. Meigs's stern sense of duty as he sees it will not allow him to retract. Still further he says that the continual lifting up of long skirts will produce paralysis. Mr. Meigs is not alone in his fight against the long skirt, for another member of the board has come out in favor of it. The majority, however, think that there should be further discussion of it. One of these wanted to know if plans and specifications of female attire must be filed with the board before a license can be issued to the wearer. He declared that it was not the business of the board to regulate the length of skirts, and that the only good such an ordinance could do would be to call the attention of women to the danger that lay in garments sweeping on the ground.

A UNIQUE MICHIGAN TOWN

Constantine, Mich., is one of the queerest towns in the country. It has a population of 3,000. A rented house is so rare as to be conspicuous. Nearly everybody owns his home.

At noon the merchants lock their doors and go to dinner. The men folks on their way to business in the morning stop at the market and leave an order for meat for the noon meal. They do not say how much, for the butcher has come to know the amount each customer wants.

The order is simply for meat. The butcher seldom has more than one kind at a time. Thus it happens that on some days the whole town eats ham, on others mutton or steak. Few canned goods are sold in the town and everybody has a garden.

Several years ago when a factory was established there it put in an electric plant. The Town Board arranged for lighting the streets from this power, and there is one incandescent light in the middle of each block. This is the only public improvement the town has had for years. The people have money and are a contented lot. When they want anything extra for their table they send to Detroit for it, or go there and stay a few days. Sometimes they go to Chicago. The people as a whole are intelligent and hospitable. When a traveling man goes to Constantine for orders he is usually the guest of a merchant. One of this class was there for a week not long ago, and it is from him that the foregoing information was obtained. All things considered, he prefers Constantine to some of the larger towns on his route, and he is authority for the statement that there isn't another town in the country like Constantine.—*N. Y. Sun*.

CURRENT NEWS AND PRACTICE AMONG THE CITIES

Telephone Statistics—How to Make Good Walks—Acetylene Gas in Germany and Sweden—Smoke Abatement—State Aid to Good Roads—A Municipal Lodging House

DISINFECTION CARS.—The North Jersey Street Railway Company in Jersey City, N. J., is disinfecting its own cars. For the purpose a compound of formaldehyd is used, costing 21 cents a pound, and each pound makes twelve gallons of liquid disinfectant. The cars are first thoroughly cleaned, and then, after being made as air tight as possible, are sprayed by means of a Red Cross sprinkler and then allowed to remain closed for a half hour. This treatment is repeated every forty-eight hours.

TRACK ELEVATION.—The latest piece of work provided for by the Council Committee of Chicago, Ill., involves a length of two miles with thirty miles of track and thirty-four subways, and will cost about \$800,000. When the tracks are raised the streets are to be paved for the two miles and in return the companies receive thirteen feet of sidewalk space on the north side of the street, lying south their tracks. They will also build a six-foot cement walk on the south side of the street and put in subways.

ONE HUNDRED FEET UNDER GROUND.—There is a scheme on foot in London, England, for an electric railway from Waltham Abbey to the Royal Exchange, to run for the most part 100 feet under ground. The cost is placed at \$10,000,000. There is to be a combination with the Brompton and Piccadilly and Great Northern and Strand Electric Tube Railways, connecting with other systems, to make a through line from the northern suburbs of London to South Kensington. Underground electric "tube" lines are projected for Birmingham, but just at present they are not considered feasible.

ELECTRIC RAILWAYS IN SAXONY.—There has been an increase in the traffic on the electric railways in Saxony since 1896, amounting to 400 per cent., taking into account the number of persons carried, etc., and 150 per cent. so far as the length of the railways is concerned. The length amounts to 221.4 miles, ninety-two and seven tenths of this being in Leipzig and seventy-three and three-tenths in Dresden. In 1900 there were 1,028 motor cars at the disposal of the roads and 403 attachable cars. The number of persons carried in 1900 was 147,645,690, and the number of accidents 338. On the line in Chemnitz the usual fare is 2.38 cents. Last year this line paid \$12.37 for every 100 marks (\$23.80) invested.

PUBLIC TELEPHONES.—The city of Winnipeg, Can., will soon have a system of telephones for the outlying districts that are unique in their way, although not entirely new. The charge for an ordinary conversation will be five cents, and may be had by inserting a nickel in the slot. Wishing to speak at one of the public telephones, the person drops a Canadian nickel in the slot, pushes a little plunger and this rings a bell in the central, after which communication can be had. The system is the outcome of the abuse of the good nature of proprietors of telephones, the company having kept account of the number of free conversations in one week. At one place not less than forty were registered in a single day.

TO MAKE CHICAGO A SECOND PARIS.—The Committee on Education of the Municipal Art League of Chicago, Ill., has devised plans whereby it is hoped to raise annually \$1,000,000 for public art work in the city. One of the schemes is to increase the membership to 500,000 by organizing branch societies in the city and suburbs. With this revenue the society hopes to make it possible for Chicago to become the most artistically beautiful city in the world, and to live off its arts as does Paris. All the clubs and societies in the city are to be invited to become branches of the Art League and each member is to pay into the league an annual assessment of \$2. The committee thinks that there are few whose interest in Chicago will not permit them to give this amount.

STATE AID TO GOOD ROADS.—No public measure in the last

decade has done more to facilitate the work of the farmer, to add to the pleasure of horse owners and wheelmen, and to make New Jersey a desirable place of residence, than the aid which the state has given for the making of permanent roads. The following list of appropriations shows how the work has been taken up and vigorously prosecuted, with ever increasing liberality; 1892, nothing; 1893, \$20,661.85; 1894, \$71,731.24; 1895, \$76,515.90; 1896, \$102,000; 1897, \$102,500; 1898, \$102,839.18; 1899, \$103,000; 1900, \$153,432; 1901, \$155,000. The sum of \$867,019.32, appropriated in eight years, for this great public improvement, is a state issue of which the people of New Jersey are justly proud, for the results have been excellent.

THE COURT ASKED TO SETTLE CLEVELAND'S TAX DISPUTE.—Hon. Tom L. Johnson, Mayor of Cleveland, O., asked for a mandamus from the Supreme Court compelling the State Board of Equalization of Railroad Property to reconvene for the purpose of changing and equalizing the value of railroad property within the state. Mayor Johnson says that he appeared before the board last June and showed that the value of railroad property in the state aggregated \$530,000,000, and urged that a fair tax value be decided on. He claims that the roads are assessed on a value of only \$117,000,000, and claims that this is a fraudulent assessment. Mayor Johnson failed to persuade the County Auditors to fix fair values in each of their respective counties and so appealed to the State Board, but this body declared that it had no power to change the valuations of the auditors. In this the Mayor says they erred and hopes to secure the writ on this point.

HOW TO MAKE GOOD WALKS.—In answer to the question as to what is the best way to prevent long stretches of artificial park walks lifting up and cracking in hot weather, Mr. J. A. Pettigrew, Superintendent of Parks, Boston, Mass., says in the *Bulletin* of the New England Association of Park Superintendents: "My experience is that the surface of the walk is apt to lift if the finishing coat is not applied before the base is partially set. A proper bond between the base and the surface coal cannot be obtained unless they are laid in one operation. Various methods are used to provide for expansion and contraction in long lengths of walks, such as strips of tar or building paper laid in the joints, sand joints, or joints cut through with a tapered tool while the walk is soft. Given the materials, properly manipulated and laid on a suitable foundation, there is no room for chance; a good walk will be the result, and it will improve in strength with each year of its life."

THE RECLAMATION OF HAVANA.—The change that the United States Government has produced in the city of Havana, Cuba, since the war, has transformed that former pest hole into a healthy city. In September, 1898, the death rate of the city was 123.12 per thousand of population. In September, 1901, it was 15.64 per thousand. Paris, Berlin, New York, Washington and New Orleans all have a death rate considerably larger than Havana, and Hull, England, with a population about equal to that of Havana, has a death rate of 25.86. The campaign against yellow fever in the city has been equally successful. For the last eleven years during the months when this disease is epidemic, the smallest number of deaths was thirty-six. The average number of deaths has been 297. During six months last year there were but five deaths from yellow fever in the Cuban city. This greatly decreased rate has been accomplished by simply cleaning the streets, thorough disinfection, and destruction of mosquitoes, and that, too, without the aid of good sewerage, improved streets or better water supply.

A MUNICIPAL LODGING HOUSE.—Mr. John Hazeltine, Superintendent of the Municipal Lodging House in Syracuse, N. Y., is very much afraid that the new administration of the city's government will not be favorable to the project. In a lecture before the class of sociology in Syracuse University, Mr. Hazeltine submitted

some figures covering the cost of operating the lodging house from its establishment on August 1, 1899, to November 12, 1901. The number of night lodgers was 12,869, meals for night lodgers, 25,738; baths taken, 11,288; meals served for one hour's work, 2,151. The earnings were \$405.04 for labor for single meals; \$9,651.75, labor for night lodgers; paid by the county, \$1,338.50, giving a total of \$11,395.29. The total cost of the house footed up \$11,401.32, leaving a net cost of \$6.03, not a very expensive undertaking, especially when the good of the work is taken into account. Each night lodger was compelled to work four hours on the streets of the city, and Mr. Hazeltine figured on the daily wage of \$1.50 for each man in estimating the labor of night lodgers given above. The care of fifty-three insane patients was not included in the statement. He has found work for 1,198 men. Further, he is convinced that the lodging house is the means of preventing crime and misery. Full records are kept of each lodger and this history would be of the greatest interest to students of criminology and the lower classes.

TELEPHONE STATISTICS.—Below are some statistics that have been compiled, showing the growth of telephones in the principal cities in the United States. It will be seen that San Francisco stands first in the use of the 'phone by a considerable margin. About every third family in the city has a telephone. Boston is second on the list, with a telephone for every twenty-four of its inhabitants. Philadelphia has made the largest relative gain in the use of the 'phones in the last year, and Louisville stands next in this respect. The statistics are:

City.	Telephones Dec. 31, 1899.	Per ct. of gain.	Pop'l'n census per tele- 1900. phone.	Pop'n 1900.
New York (all boroughs)	53,128	70,870	33	3,537,202 48
Buffalo	5,107	6,639	30	352,219 53
San Francisco	16,817	21,324	27	342,782 16
Boston	19,905	23,780	19	560,892 24
Minneapolis	6,210	8,038	28	202,718 25
Cleveland	13,158	14,570	11	381,768 26
Detroit	7,434	10,190	37	285,704 28
Milwaukee	6,893	8,492	23	285,315 33
Manhattan (N. Y.)	39,770	53,275	33	1,850,093 35
Pittsburg	7,409	9,129	24	321,616 35
Cincinnati	7,161	9,142	28	325,902 35
Man. & Bronx (Old N. Y.)	40,437	54,647	35	2,050,600 37
Louisville	3,539	5,049	43	204,731 41
Newark	3,701	4,434	19	246,070 55
Washington	3,278	4,650	42	278,718 60
Chicago	21,237	27,734	31	1,698,575 61
New Orleans	3,274	4,415	35	287,104 65
St. Louis	6,309	7,512	18	575,238 76
Baltimore	5,340	6,250	17	508,957 81
Brooklyn	10,379	13,366	28	1,166,582 87
Philadelphia	8,263	13,451	63	1,293,697 96
Jersey City	1,607	1,906	18	206,433 108

SMOKE ABATEMENT.—In those towns where the subject has been given serious attention, it has been demonstrated that the nuisance created by smoke from chimneys is entirely unnecessary. Smoke consists of unburnt or incompletely burnt gases and carbon, which, with the proper apparatus, can be consumed in the same furnace from which they come, at the same time materially reducing the consumption of fuel. Not only is the smoke injurious to the health, but it disfigures the houses both inside and out and interferes with the general comfort of the inhabitants. In England the law regarding smoke prevention deals only with the smoke from manufacturers, exempting the chimneys of private dwellings. A weak portion of the law is in the fact that, if the court is satisfied that in the case of a complaint that a furnace is constructed in such a manner as to consume as far as possible, all the smoke arising from it, no nuisance shall be considered created. Thus there will be seen the difficulty of administering this act. Mr. William Nicholson, Chief Smoke Inspector of Sheffield, Eng., says that there are seven causes for smoke from furnaces, viz: Ignorance as to the principle of combustion on the part of managers and men; irregularity of firing up and the use of too much coal; indifference on the part of those in charge of the boilers; defective draughts depending on small flues, etc.; insufficient boiler power; use of inferior fuel; and the apathy of manufacturers, who do not know that they are wasting fuel. To prevent the emission of black smoke it is necessary that the right

quantity of air to consume the fuel be admitted to the furnace. With properly constructed flues and furnaces, this can be effected by a careful, intelligent fireman. If one of the smoke consumers that are on the market is added, all smoke will be abated.

COUNTY LIBRARIES PROPOSED.—At the seventh annual meeting of the Ohio Library Association, held at Sandusky, O., in October, several interesting propositions were presented. One of the delegates stated that Frederick M. Cruden, of St. Louis, Mo., had requested her to explain his plan for a model library at the Exposition in 1903. Instead of having in one part of a large building a collection of 1,500 or 2,000 books which would attract very little attention, his plans is to have a separate building, which shall be a model library in every way, in architectural design and arrangement. The books are to be selected by the coöperation of the principal libraries in the country, and the library to be in actual operation on the grounds. This would be a branch of the St. Louis library and in some part of the building there would be a comparative exhibit of library methods. Mr. Wicoff, of Sidney, O., gave an exposition of the existing library laws in Ohio, showing the different statutes under which libraries can be organized. A resolution was passed unanimously approving a bill that will be introduced into the Legislature at the next session, providing for the organization and maintenance of county libraries. It will allow those libraries having a well equipped library at its county seat to extend its privileges to the rest of the county. Those counties having no well equipped library, upon the presentation to the county commissioners of a petition signed by more than 50 per cent. of the electors, shall be allowed to establish such a library. To meet the expenses a levy is to be made by the county commissioners. There shall be appointed by the state library commission a state library organizer, whose duties shall be to aid in the work of establishing new libraries, inspect and advise those established, and keep a general supervision over all in the state.

ACETYLENE GAS IN GERMANY AND SWEDEN.—In Germany acetylene gas is emerging from a crisis which almost retired it as an illuminant. In 1896 an awful explosion of the gas occurred in Berlin. The press denounced its use, the police and insurance companies adopted such repressive measures that now only the safest machinery is constructed and the numerous accidents are no longer common. The advantages claimed for it are many, such as its near approach to daylight, fifteen to twenty times less power than coal gas necessary to produce the same illumination, and six times less heat when used for illuminating purposes. For the manufacture of gas producing appliances there are now in Germany 235 factories, some making everything in the line of acetylene-producing machinery. In the tests by the government for the use of acetylene in light houses it was found that the gas was good for those houses readily accessible in all weathers, but was not so reliable as electricity. It was found that in foggy weather the light would not penetrate as far as oil, which penetrates farther than any illuminant. For military purposes there is the acetylograph or portable signal light, and the hospital corps has a hand light with a small gas generator attached to a belt and connected with a reflector by a hose about three feet long. For domestic uses successful experiments have been made with the gas as an aid to photographic light, when making time exposures. Several towns are illuminated with the gas. Acetylene has been in use in Sweden for about ten years and is in practical use in railroad stations, houses, etc., but no reports have been made on its use in lighthouses. In several Swedish steamers the gas is used for side lanterns and searchlights. According to calculations, the use of the gas in Sweden is more economical than petroleum or coal. For example, a factory having fifty lamps of sixteen candle-power each and burning 720 hours per year, would have the following expenses for lighting per year: Oil, refined, \$149.97; coal gas, \$291.85; electric light, \$236.88; and acetylene, \$125.43. These figures are based upon the average price of gas and electricity and calcium carbide at \$3.28 per hundred pounds. If certain regulations are complied with and the gas works are of an approved type, the insurance companies do not make any discriminations against persons who use the gas.

A CONFERENCE UPON OUT-DOOR ART

THE American Art and Outdoor Association is doing good work in disseminating information in regard to the uses that can be made of nature. Photographs play an important part in its work, for the ugly and the beautiful in cities are contrasted by this means. In order to awaken interest in the meeting of the association that is to be held in Boston, Mass., next summer, a conference of gentlemen was held lately at the Twentieth Century Club in that city. President Eliot, of Harvard; Warren H. Manning, secretary of the association; Arthur A. Shurtleff, Harlan P. Kelsey, C. Howard Walker, Professor Langford Warren, and Kate G. Wells were among the speakers at this conference.

President Eliot spoke on the question as it related to village improvement and education. He said that the park work was a movement in the interest of self-preservation; the effort of people to get back to nature. The loss of training that the country life gives to the children cannot fully be replaced. The park is all that can be offered in the way of a substitute. It is of great importance from an educational standpoint that the mind should be stored with fair pictures. Outdoor art brought association with engineers, bridge builders, architects and nurserymen.

Secretary Manning told of the work that the association had done in Chicago, Milwaukee and other cities, not only in the matter of parks, but also in the improvement of school grounds. He spoke of the good work that the woman's auxiliary was doing. It is the purpose of the association to bring together all those interested in outdoor art. He showed lantern slides from which was pointed out the good and the bad in outdoor art.

Mr. Shurtleff, in speaking on the relation of the parks in the city of Boston and the metropolitan park system, pointed out that what the Park Commissioners had really done was to take the waste and unlovely places left and the places inaccessible for building purposes, turn them into parks and beautify them.

Mr. Walker showed the relations of landscape to architecture. He thought as nature was brought closer to the heart of the city it should be better groomed, that is, more carefully considered in relation to architecture. The arrangement of trees, shrubs, spaces, etc., should be carefully studied. The work of English and Continental cities in this respect was shown by lantern slides.

Professor Warren corroborated Mr. Walker and stated that he thought that in the country the architecture should be subservient to natural conditions, but in the city the bits of nature that were introduced should be brought into harmony with the architecture.



CHEAPER LIGHTS IN KANSAS CITY

THERE has been some friction between the municipal government of Kansas City, Mo., and the Electric Light Company that has been furnishing light to the city. Back in August of this year one of the leading newspapers of the city criticised the Mayor on the ground that the company was willing to reduce the price of the lights from \$110 to \$82.50 a lamp per year, and, if the city would increase the number of lamps to 1,000, (they were then supplying 265), the price would be lowered still further, to \$75.00. It was claimed that the delay in accepting the company's proposition was due to personal feelings on the Mayor's part toward the company.

When asked to state his side of the matter, Mayor James A. Reed said: "When I took office in April, 1900, I found the city paying \$110 for arc lights. Within a very few days after I took office, I interviewed Mr. C. F. Holmes, president of the Electric Light Company, and told him that the price charged was entirely too high, and asked him to reduce it to \$75.00. He declined to consider a reduction unless the city would practically agree to double its consumption of light. I told him that we had made our apportionment for lights for the year and that it could not under the circumstances be increased, but that if he would reduce the price of lights we would continue to use the entire apportionment, the effect being that he would get less for each light furnished. After learning this fact, and knowing that it was impossible for the city to increase the amount of its apportionment, Mr. Holmes offered to reduce the price to \$87.50, provided that the city would double the number of

lights. In other words, he made a proposition which he knew well we could not possibly accept. Matters remained therefore *in statu quo* until about the month of September, 1900, when I sent a message to the council advising it that, by reason of the payment and redemption of city bonds, the city had arrived at a point where it could issue a sufficient number of bonds, still keeping within the constitutional limits, to enable it to build a municipal electric lighting plant. No sooner had this message been sent to the council than Mr. Holmes opened negotiations to reduce the price of light. Several conferences between myself, the Speaker of the Lower House of the Council, and Mr. Holmes, were held. We succeeded in getting him to make a proposition of reduction to \$82.50. This proposition was not even submitted, if I remember correctly, until about the month of April. It was immediately transmitted to the Board of Public Works and the Common Council by myself in a message, and the request was made that the Board of Public Works be authorized to enter into a contract at the price named, \$82.50. The Board of Public Works did almost immediately prepare and sign this contract and sent it to the council, but for some reason, which beyond doubt can be explained by the statement that Mr. Holmes had been able to hold up almost any proposition in the council, no action was taken on the ordinance for some time. Finally, however, it was approved, and after considerable negotiating, the electric light company agreed to accept the price of \$82.50 from the date of their proposition. The above statements are the facts in the matter, all of which can be demonstrated from our public records, except the matter of conversation, and that can be proven by indubitable evidence."



TAX RATES OF CALIFORNIA CITIES*

THE tax rate of various cities are given below. It has been impossible to obtain a complete report from all the cities. In making comparisons it must be borne in mind that the sixth class towns have no authority to levy school taxes; such taxes are levied by the county supervisors and are not included herein:

	Total.	School.	Bond.	Library.
Santa Barbara .....	.135	.11	.24	.05
San Jose .....	.125	.215	.25	.03
Oakland .....	.129	.13	.06	.062
Sacramento .....	.130	.09	.065	.06
San Bernardino .....	.165	.25	.60	.05
San Rafael .....	.100	.1923	.1287	.053
Petaluma .....	.100	.20	.10	.075
Visalia .....	.200	.65	.52	..
Marysville .....	.250	.21	.29	..
Santa Clara .....	.100	.20	.45	..
Santa Cruz .....	.145	..	.807	.08
Tulare .....	.133	.33	.10	..
Grass Valley .....	.75	..	.25	..
Santa Rosa .....	.120	..	.25	.05
Woodland .....	.147	.35	.30	.02
Chico .....	.90	..	..	..
Alameda .....	.120	.234	.162	.062
Napa .....	.85	..	..	.10
San Mateo .....	.120	..	.41	.05
Red Bluff .....	.90	..	.16	.04
Riverside .....	.100	..	.25	.10
Anaheim .....	.130	..	.62	..
Sausalito .....	.65	..	..	..
Benicia .....	.110	..	..	..
Redding .....	.85	..	.15	.02
Santa Monica .....	.100	..	.16	.09
Suisun .....	.100	..	.50	..
Vacaville .....	.75	..	..	..
Orange .....	.60	..	..	.10
Sonoma .....	.75	..	..	..
Redlands .....	.100	..	.19	.09
Lakeport .....	.80	..	.34	..
Colusa .....	.110	..	..	.10
Redwood .....	.134	..	.60	.10
Watsonville .....	.100	..	.24	.07
Fort Bragg .....	.60	..	..	..
Pacific Grove .....	.70	..	..	..
Healdsburg .....	.105	..	.67	.10
Emeryville .....	.50	..	..	..
Palo-Alto .....	.125	..	.5461	..
Mill Valley .....	.75	..	..	..

*California Municipalities.

A THRIFTY NEW ENGLAND CITY

AMONG the smaller municipalities of New England there is none that furnishes better opportunities for investment and industrial enterprise than the city of Nashua, N. H.

Admirably situated near the southern border of New Hampshire at the confluence of the Merrimac and Nashua Rivers, the city, through its natural commercial advantages, is one of the best located in that section of the country. It is rich in industries of all classes, its streets are broad and well kept, and well lighted. Particular attention is paid to the keeping of sidewalks in thorough repair, while the sewerage system is of the most modern construction.

It is the commercial advantages which this city affords that has made Nashua one of the most progressive and up-to-date cities of the New England group. Five lines of steam roads centre here, thus offering unexcelled shipping advantages. Nashua has well been termed the "Gate City" of New Hampshire.

But Nashua is not only noted as a railroad centre, but it is also

supervision of a Board of Education, comprised of leading business and professional men.

The prosperity that has come to Nashua during the past decade has been very marked. Many large business blocks have been erected during this time, new manufacturing establishments built, while in point of population the city has grown from 19,000 to about 25,000. It is the industries that furnish the life blood of Nashua. Its cotton mills furnish employment to upwards of 3,000 people, it has two of the largest shoe shops in the country, giving employment to about 2,000 people, and many hundreds of skilled mechanics are given employment in the various other manufacturing establishments.

Just at this time Nashua is undergoing a period of building. A magnificent new library building, a court house and registries of deeds and probate building, a large Y. M. C. A. gymnasium building are in course of construction, while a number of other buildings, including a post office, are to be erected in the near future.



ONE OF THE MAIN BUSINESS STREETS OF NASHUA

gaining much prominence as an electric railroad centre. With the line already started between Concord, Manchester and Nashua, direct electric communication may be had from Boston to the foot of the White Mountains.

If there is one thing above another in which the citizens of Nashua take pride it is in their well laid-out streets. The principal paving in use is granite blocks and asphalt, while the streets in the residential sections of the city are constructed of crushed trap rock. This year, especially, much attention has been given to the construction of good roads, and the success which the present administration has met with in this particular is a matter in which the citizens generally may well take pride.

The educational facilities offered in this city are of the best. This department is conducted on the most modern principles under the

Considerable encouragement is found by the municipal authorities in the general pride taken in the city's beauty by her citizens. On January 1 of this year, when Mayor Taylor delivered his inaugural address, he advocated civic improvement as a means of attracting new residents to the city. This suggestion has proved a very popular one, and has added to the beauty of the residential districts.

Within a few months a new Board of Trade has been organized, which already has made itself felt in the industrial welfare of the city. This board takes particular interest in municipal affairs, and its suggestions are of value to the members of the city government.

Because of the activity displayed by her citizens the continuous growth of Nashua is absolutely assured; in short, all conditions appear favorable and insure a great future for the second city of New Hampshire.

NOTTINGHAM RAILROADS

MUNICIPAL ownership in Nottingham, England, has passed beyond the experimental stage. The report for the year ending March 31, 1901, shows a great gain over the preceding year and establishes the system of municipal ownership in Nottingham for good. Horse traction prevails in the city, though electric traction is being introduced. The total cost of running the horse tramways during the year was £30,848 4s. 1d., and the entire income from traffic receipts, advertisements and sale of manure was £43,263 17s. 9d., which leaves a net profit of £12,415 13s. 8d. for the city. To run the electric tramways for the year it cost £2,288 5s. 9d., and these yielded a revenue of £4,810 12s. 4d., the balance being considerably more than enough to pay the interest on £180,358, which the tramways cost.

The report of the Electric Lighting Department is quite as satisfactory as the following profit statements of 1899 and 1900 show:

	1899.	1900.
Interests on loans.....	£4,347	£6,337
Sinking fund for repayments.....	3,175	3,175
Net profit carried to credit of general rate.....	2,000	6,000
Net profit carried to reserve fund.....	—	2,408
Net profit carried forward.....	151	—
 Gross profit	 £9,673	 £17,920



MUNICIPAL TRAMWAYS AT DOVER

THE municipal tramways at Dover, Eng., are doing extremely well, as is demonstrated by the report and accounts just issued. Mr. Edward Carden, the general manager, has prepared the following interesting comparative table:

Year ended March 31.	1899.	1900.	1901.
Total receipts.....	£9,297	£10,454	£11,141
Total net receipts.....	1,730	1,487	1,067
Total passengers.....	2,170,590	2,437,863	2,710,420
Total mileage.....	204,257	242,434	259,358
Total current consumed.....	200,184	252,380	276,473
Average receipts per car mile.	10.52d.	10.35d.	10.31d.
Average net rec'ts per car mile	2.03d.	1.47d.	0.99d.
Average working expenses...	5.61d.	5.51d.	5.33d.
Average total expenses.....	9.06d.	8.88d.	9.32d.

The accounts show the following figures:

Traffic receipts	£10,780
Receipts from advertising.....	344
Sale of old material.....	16
Claims for damages.....	1
 Total	 £11,141
Wages	£2,816 3 10
Electric current	3,167 18 8
Repairs	1,242 19 4
New works, etc.....	116 11 9
Stores and sundries.....	196 8 11
Uniforms	81 6 9
Establishment charges	571 14 1
Interest and instalment on loan capital.....	2,075 12 6

Total £10,268 15 10

After allowing for stock in hand there was a profit at the end of the twelve months' working of £1,068. Nearly 2½ million passengers were carried during the year, or equal to 21 per cent. of the population. Although halfpenny fares are in vogue the majority of the passengers indulged in penny rides, the average number of penny fares being 8,687, as against only 788 at a halfpenny. With a view to inducing the conductors to take greater interest in their work, monthly bonuses for the highest receipts are paid by the corporation, and a recent increase in the amount of the bonus has resulted in keen competition among the men, and a corresponding increase in the takings. The earnings per car mile were 10.31d., and the total expenses 9.32d., of which 5.33 is put down as working expenses. The receipts show an increase of £686 over the previous year, while 272,557 more passengers were carried. The total amount of loan capital is £38,350, of which the bulk is borrowed at 3 per cent. for thirty years.

WORKING OF SAND FILTRATION AT ALBANY

INTERESTING statistics relative to the filtration plant at Albany, N. Y., has been sent us by the superintendent, Mr. George I. Bailey, C. E. The plant is the largest of its kind in the country and a brief description of it, together with the cost of operation and maintenance to date, cannot be other than interesting. The water is taken from the Hudson River and is raised eighteen feet by pumps into a reservoir that acts as a settling basin. Thence it passes to eight filter beds, each 258 feet long by 121.33 feet wide, which are arranged in two parallel rows, and all open on a central court between the rows. In the court the sand is washed and stored and other operations take place. The beds are rectangular, of brick and concrete masonry, with a water-tight floor of concrete. They are roofed with concrete arches covered with two feet of earth and this roof is carried by brick columns, thirteen feet, eight inches apart and the height from floor to roof is twelve feet six inches. A collector drain from thirty feet to twelve inches in diameter is laid through the centre of each filter underneath the concrete floor. Connected with this main drain are cross drains, six inches in diameter, laid in parallel rows thirteen feet, eight inches apart, with open joints.

Above the six-inch drains is placed, first, gravel from two to three inches in diameter, thick enough to cover the top of the drain; secondly, a gravel about a half-inch in diameter, is laid in a layer of three-inch thickness throughout the bed; next, gravel of the size of a pea is spread in a two-inch layer on the bed and on this is placed screened sand to the depth of four feet. Four feet of water is flowed onto the bed and then passes downward into the drains at an average rate of from four to five inches per hour. This "slow sand filtration" yields per day three million gallons of water per acre of filter. After leaving the filters the water enters a reservoir whence a steel conduit, four feet in diameter, and 8,000 feet long, conducts it to a central pumping station, where it is pumped into reservoirs and distributed to the city.

The complete filtration plant was started in operation in 1899. There are two centrifugal pumps having a capacity each of 16,000,000 gallons per day. The sedimentation basin is 382.7 feet wide by 600 feet long, and has a supply to filter level of 5,700,000 gallons. The clear water basin is ninety-four feet square, with a capacity of 600,000 gallons. About every twenty-five days the beds are scraped and an average depth of sand is removed at each scraping of .62 inches. By this method of filtration an average of 99.1 per cent. of bacteria is removed. The normal turbidity of the river water, .035, is completely removed as well as 20 per cent. of the normal color.

The efficiency of this filter plant as regards its lowering of the death rate from typhoid fever is shown by the following data: The death rate from this disease for the previous ten years was 84 per 100,000; for the first year's operation it had fallen to 34; for the second year, it was 27. The general death rate was decreased 19.7 per cent. in the first year, and 18.7 in the second. The decrease from diarrhoeal diseases was 44.1 per cent. in the first year and 60 per cent. in the second.

The total cost of construction of the filter beds, including the piping and laboratory, was \$225,000, and the total cost of plant amounted to \$499,890. The cost of the several portions of the plant was as follows: Land, \$8,290; pumping station and intake, \$49,745; sedimentation basin, \$60,000; construction per net acre of filter, including cover, \$45,600; construction of pure water reservoir, \$9,000; pure water conduit and connections, \$86,638; engineering and contingencies, \$31,000. The cost of maintaining the filter beds and their operation per million gallons has been determined as follows: Scraping beds, 22 cents; wheeling out scrapings, 40 cents; washing sand, including wash water, 40 cents; replacing sand on beds, 27 cents; incidentals and lost time, 26 cents; materials and supplies, 10 cents; total cost of maintenance, \$1.65. The cost of laboratory work per million gallons is 28 cents and the cost of pumping, \$2.72. This makes a total cost of maintenance and operation of \$4.65.

DUBLIN'S NEW CENTRAL STATION AND FIRE ESCAPE

By Our Special Correspondent

TEN years ago, when Captain Purcell took charge of the Dublin, Ire., fire department, things were in anything but an up-to-date condition. He steadily devoted his time and brains to bringing the brigade into a new condition, obtaining his information from visits to stations in Europe and America on his own time and expense. With the information thus gathered, he designed apparatus and stations especially adapted to the needs of Dublin. His one great want that has not yet been satisfied, is a central station worthy of his city, and after six years of working his efforts are about to be rewarded. The station will cost about \$125,000, and will be a fine structure. It will provide accommodations for the headquarters and working departments as well as for the chief and second officers, twelve married firemen and their families, and apartments for about sixteen single men, with kitchen, dormitories, bath rooms, lavatories, etc. The working department will contain a large engine house with room for five machines, stalls for nine horses, offices and watchroom, reserve stables, workshop, laundry, lofts and gymnasium. A large clock tower will be used as a lookout station and a place to dry hose. The chief's residence will be like a separate house in itself, and those for the men will be separate apartments of ample proportions. The means of access will be by way of external iron stairs and balconies. The floors of the stables and working rooms will be of concrete, of the living rooms of concrete covered with boards. At present the men of the central station are compelled to reside in neighboring tenements, which are in the most wretched condition. In case of fire at night they have to be aroused by messenger. Thus the new station will house the men properly and will afford sufficient accommodations for horses.

It is proposed to change the system of escapes, and, instead of having them in different parts of the city where they have to be watched and are liable to rot and decay, it is proposed to have only four escapes in the city, and they shall be horsed escapes of the most approved pattern. At present the man in charge of an escape is dependent on the service of anyone he can get to help him run the escape to the fire, and is usually exhausted when he arrives, and of no use for fighting. Then, too, the men that are needed to watch the escapes will be available for other work. The situation of the new station is in the heart of the business district, with good outlets in all directions.

One of the new appliances of which Captain Purcell is very proud is an aerial truck, known to the British as "a swivel-built-radiatory-extension-horsed-escape," built by Rose & Company, of Manchester, from Captain Purcell's designs. It is intended for narrow alleys, the ladders can be raised by two men before the truck has stopped, and one man can turn them from one roof to another with the greatest ease.

The new escape consists of a series of trussed ladders fitted telescopically, and pivoted at the lower end in a steel turntable, which is capable of being revolved by phosphor bronze gearing within its base. The whole is mounted at the back end of a four-wheeled steel truck, with locking fore-carriage, lever brakes, and pole for two horses. While traveling to a fire the set of ladders lie in an oblique, nearly horizontal position, with a portion of them projecting between the drivers' seats over the horses' back. When required for use the ladders are raised to the vertical position by means of a flexible steel rope rove through shrouded pulleys at both sides in the outer ends of a rocking frame, which is pivoted to the turntable in advance of the ladders, and led over pulleys in tubular steel stanchions, also mounted on the table, to the winding-drums on a geared winch carried in its base. The turning of a single crank-handle at the back of the truck elevates the ladders, or swings them around into any position by the aid of one man. At the same time, the ladders may be extended to the necessary elevation by the geared winch provided for that purpose. The present set can be made to reach a height of sixty-six feet above the ground. The handles are always in position, and no adjustment is required for operation, everything being ready. Automatic locking devices are provided, so that the ladders will remain up at any angle or height required without

attention. A small trussed ladder, fifteen feet long, and a trussed extension ladder to reach twenty-eight feet are also carried in the framing beneath the main ladder, and may be removed from the truck for the use of lower floors, courtways, etc., without interference with the principal escape. Provision is made for carrying a supply of hose and all the small appliances necessary for equipping the brigade.

The ladders are constructed on a new principle, the sides being



DUBLIN'S NEW ESCAPE OR AERIAL TRUCK

straight-grained Oregon pine, trussed with meldless steel tubes, neatly mounted in aluminium bronze stanchions, and caps, which carry guide rollers to reduce the friction. The steps are of cleft oak, secured to the sides independently by aluminium sockets of a novel form.

The new escape occupies no more space than an ordinary tender, and may be run under any archway or other overhead obstruction

that is nine feet high. A great advantage over the ordinary form of escape, which must have support at the top against the building, is that the new one may be elevated on the street independent of any extraneous support, and used as a water-tower, lines of hose being carried up and directed on to the fire in upper floors through the windows. It can also be used to reach ordinarily inaccessible places —under domes, high roofs, etc.

FIRE, WATER AND POLICE ITEMS

POLITICS THE CAUSE.—According to press reports the fire department of Denver, Colo., is demoralized. Half of the men have to work in politics, discipline is cast to the winds and men come and go regardless of the captains. Chief Roberts admits that the department would be powerless in case of a big fire. When an alarm comes in the apparatus goes out with but two or three men in charge.

STREET CARS IN THE WAY.—Chief Swingly, of the St. Louis Fire Department, has resolved to have some law passed to compel the street car companies to instruct their men to give the fire apparatus right of way in the streets when going to a fire. He has caused an investigation to be made to determine the responsibility for the numerous accidents that have happened between fire apparatus and the street cars. The Chief says that he will try legal prohibitive measures if no agreement can be reached with the managers of the street lines.

SALT SPOILS CITY WATER.—The water supply of Findlay, O., has been spoiled for use by a great percentage of salt in its composition. The water cannot be used for drinking, nor can the manufacturers use it in their boilers. Even sprinkling cannot be done with it. Farther up the river salt wells are being pumped in the hopes of finding oil, and this is the cause of all the trouble. There are springs east of the city that will, in all probability, be utilized, but this means the abandonment of a plant that cost the city nearly \$400,000 to install.

RIVER THAMES WATER SUPPLY.—From the report of the Water Examiner for July, 1901, on the condition of the water of the River Thames, England, the following statistics have been taken: The average daily supply delivered from the Thames was 155,688,265 gallons, 62.66 per cent.; from the Lea, 31,510,209 gallons, 12.68 per cent.; from springs and wells, 61,265,284 gallons, 24.66 per cent.; from ponds at Hampstead and Highgate, 6,330 gallons. The daily total was 248,470,088 gallons for a population estimated at 6,249,551, representing a daily consumption per head of 39.76 gallons.

WATER COMPANIES MAKE MONEY.—The eight water companies that supply the city of London, Eng., every year reap rich harvests. It is persistently claimed that a municipal water supply would not pay, yet the report of the Local Government Board shows that the profits of the combined companies during the year were nearly \$5,250,000. The following are the net profits for each of the companies for the year: Chelsea, \$450,600; East London, \$722,710; Grand Junction, \$516,620; Kent, \$589,220; Lambeth, \$775,080; New River, \$1,315,355; Southwark and Vauxhall, \$319,205; West Middlesex, \$597,725.

BERLIN LEARNS LONDON'S METHODS.—Although the municipality of Berlin, Germany, is considered about perfect in every branch of its government, in police methods it has been compelled to study those of the police of London, England. For the second time the head of the Berlin police has resolved to send a commission to London with the object of studying the working of the police regulations of the latter city. Especially will the far-famed regulations regarding the street traffic be observed. Two years ago a similar delegation visited London, but its recommendations produced little effect on the methods prevailing in Berlin.

JAPANESE FIRE DEPARTMENT.—The Japanese are considered the Yankees of the East, and in many respects their advance in civilization renders them worthy of the name, but in regard to fire protection they are woefully behind the times. The dwellings in

Japan, being very flimsy in construction, catch fire very easily and the fire department should therefore be the first to undergo development, but such is not the case. The whole department consists of hand engines, that can be carried by two men, and buckets. Valuables are not kept in the dwellings, but in every village is a tower, with iron doors and window shutters, where the inhabitants store all the stuff that they do not wish to be lost by fire.

FOUR GENERATIONS IN THE SERVICE.—For four generations an English family has had one of its members connected with the fire service. In the reign of George IV., Fireman Tozer served in the "Hand-in-Hand Insurance Company's Fire Brigade" for twenty years. His son was chief of the Manchester Fire Brigade for thirty-one years. A. R. Tozer, the grandson of the old fireman, has been Chief Officer of the Birmingham Fire Brigade for twenty years. His son, A. Tozer, has just been appointed assistant to his father at Birmingham, being known as the Second Officer in the Brigade. Both this young man and his father were literally born in the service and have rendered valuable assistance in the work of the Brigade.

BAY CITY'S FIRE DEPARTMENT.—Chief Harding, of Bay City, Mich., has just published his eighteenth annual report on his department. The personnel of the department is composed of forty-three men who take charge of six hose companies, two truck companies and one chemical company. There are in the department five hose carriages, four hose wagons, two steamers, two hook and ladder trucks and over 195,000 feet of good hose. They have the Gamewell Fire Alarm system in the city and the storage battery service recently installed gives the best satisfaction. There were 154 alarms sent in during the year and the total loss was \$134,287.50, an increase of nearly \$53,000, but this was mainly due to a large fire on a lumber dock.

MUNICIPAL FIRE INSURANCE.—The London (Eng.) County Council has been asked to become the insurer of its property and have all the London local authorities enter into the scheme when they wish to do so. The Council shall form an insurance fund and there shall be paid into this fund the premium on insurance and interest on accumulated funds. If at any time the funds are not sufficient to meet the liabilities, the Council can raise money by the county rate, or borrow it, with the consent of the Treasury, from the Consolidated Loans' Fund, paying interest on it to this Fund. The present tariff rates paid to the companies shall continue for the first five years, afterwards the premiums shall be adjusted as the needs of the reserve fund indicates.

TO INSPECT HYDRANTS AND BUILDINGS.—Chief Ferber, of the Scranton, Pa., fire department, in conjunction with Director of Public Works Wormser, expects soon to put into service a plan that they feel will greatly lessen the danger from fire. One permanent man from each district is to be detailed to inspect all hydrants to see that they are not frozen and are in proper condition, and to examine all large buildings in his district to see that rubbish and waste are not allowed to accumulate. His duties for the month are to be confined to this work entirely and he is to be held responsible for any neglect of duty. It will be his duty to order all rubbish removed and report if the owner does not carry out his orders. In case of a frozen hydrant, he must secure help and thaw it out immediately. The Chief also intends to have his men familiar with the construction of all large buildings in each district, so that they will know where to go when a fire occurs in any building. To accomplish this, the men will be taken through the buildings in their several districts.

FIREMEN'S ACCIDENT INSURANCE

By Walter E. Price *

THE Illinois Firemen's Association enjoys the unique distinction of being the only firemen's association in the United States which provides an accident indemnity for its members at actual cost.

The scheme is very simple and was adopted by the Executive Board in April, 1899, and commenced its work of relief on May 2 of that year. It is as follows:

Section. 1. When the secretary of the association shall receive notice of a severe disabling accident, attested by affidavit of the chief in which department it occurred, also by certificate of reputable physician specifying nature of injury, causing at least seven days' disability incurred going to, while at, or returning from a fire, he shall first assess each department for a sum equal to five cents multiplied by the number of active firemen in the departments in towns of less than 30,000 in habitants.

Sec. 2. Those responding with money in thirty days shall be the protected roll of departments.

Sec. 3. Out of such proceeds he shall transmit to the chief of the afflicted department the sum of one dollar a day for seven days of fourteen days, at his discretion, and so on until the recovery of the member, provided such installments do not amount to more than one general assessment, which in case of death or long confinement shall go to the department for its afflicted member.

Sec. 4. The remainder, if any, left after such indemnity, shall constitute a part of the association indemnity funds, and can be applied to accidents without new assessments.

Sec. 5. Any department losing place by failure to pay assessment and wishing restoration to the protected roll, can be restored by the payment in advance of one assessment.

Sec. 6. The secretary shall keep a record of all the departments paying assessments and of all disbursements of the funds made by him, and make a public report of the same to the association and its auditing committee at each annual convention.

Sec. 7. The secretary shall be named the secretary and treasurer of the Accident Indemnity Fund.

To facilitate the matter of furnishing proof required in establishing a claim, a blank affidavit has been prepared, wherein the name and occupation of the claimant and the time, place and cause of injury is specified; also the number of days the claimant remains

* Secretary of the Illinois Firemen's Association, Champaign, Ill.

disabled from performing his usual occupation. This affidavit is made before a notary public by the chief of the department of which the claimant is a member. Attached is the certificate of the attending physician, who certifies to the nature of the injury and its duration. When this affidavit and certificate are properly filed, signed and sealed, and filed with the secretary, showing the claimant entitled to relief as provided by the rules governing the indemnity plan, a draft for the amount payable to the order of the claimant is immediately forwarded the chief and another assessment called if the condition of the fund warrants.

It is easily perceived that the intent of the above plan is to furnish a moderate indemnity in a cheap, simple and practical manner. No device that necessitates the issuance of policies to individual firemen or certificates of membership, even to departments, is countenanced. But instead of this plan, the plan contemplates the payment of small assessments, which assessments when paid regulate the status of the departments paying and belonging. It has no complex administrative machinery and there is no delay in giving relief to the afflicted member when the requisite proof has been made. The actual cost of providing this relief is a mere trifle in comparison to the amount charged for similar indemnity by accident insurance companies. By a glance at their rate books you find the average cost to a fireman is \$12 per year for \$7 per week indemnity. A clerk, who would be rated in the preferred class with \$10 or \$15 per week, should he receive an injury while on duty as a fireman, would only be entitled to the indemnity provided for the hazardous class, that pertaining to the occupation of a fireman—\$5 or \$7 a week.

Since the indemnity plan commenced operations in May, 1899, eight assessments have been called, making the total cost to each firemen protected 40 cents, being equivalent to a rate of 1 1/9 cents per month.

Twenty-seven men have been injured while in the line of duty, the total loss of time being 449 days, and they have been paid \$449 therefor.

It is true the indemnity plan is yet in its infancy, but the possibilities of enlarging the scope of its beneficent work are great and the future will disclose what use is made of them. With an honest administration and a small increase in the assessment, a sick benefit could be added, thus assuring relief at all times when most needed.

FIRE, WATER AND POLICE ITEMS

POLICE GYMNASIUM.—The Board of Police Commissioners of Jersey City, N. J., have decided that the members of the force must have a gymnasium. The police surgeon will examine the men to decide what exercise each one needs and this exercise he will be compelled to take on pain of dismissal from the force. The stout policemen will be compelled to reduce their weight and the ones weak in chest and limbs will be built up in the weak spots. A competent instructor will be engaged to train the men.

"FIRE-FLY" AND "GUM-SHOE" POLICE IN PARIS.—The prefect of the Paris police has ordered the abolition of the top boots for the police and the substitution of light, noiseless shoes. Another change will be red and white incandescent bulbs in the kepi and on the end of the baton of each member of the traffic squad, so that he can convey orders to coachmen in the dark by pressing a button. All the automobiles must now carry speed indicators so that the bicycle police can tell whether or not the speed regulations are broken.

TO DRILL WATCHMEN.—Chief Musham, of the Chicago (Ill.) Fire Department, has given orders that his battalion chiefs shall drill the watchmen of all warehouses, stores, factories, etc., in the performance of their duty when fires occur. Particular instructions must be given the watchmen as to the proper way to send out telephone alarms, and as to the location of the nearest fire alarm box. The lack

of knowledge on the part of the watchmen as to what they should do first in case of fire was shown recently when several large fires gained great headway before the department was notified.

GRAND RAPIDS FIRE DEPARTMENT.—The Fire Commissioners of Grand Rapids, Mich., have lately issued their report for the year ending April 30, 1901. It is especially comprehensive, in regard to the recommendations for the improvement of the department. A life saving or jumping net is recommended for each of the three trucks. Each engine and truck company should have an additional man, so that when the men take their days off the service will not be weakened. An infirmary is strongly recommended and a department surgeon should be appointed to pass upon the condition of men when sick and report when they are able to return to duty. Additional pipe lines and hydrants should be placed in districts in which are the tallest buildings. The city has been under the municipal inspection of electrical work for three years and the greatest benefits have been derived from this supervision. The fire alarm underground work is in excellent condition. The companies that use the department poles, bear half the expense for repairs. The working force of the department consists of 127 men and fifty-eight horses. There are eight steamers, ten hose wagons, three ladder trucks, a fifty gallon double tank chemical engine, and one of thirty gallons capacity, and one steamer in reserve. There were 392 fires during the year, with a loss of \$129,538, or a per capita loss of \$1.36.

INTERNATIONAL PUBLIC HEALTH WORK PROPOSED

In order that there may be better and simpler quarantine inspection among the republics in the Western Hemisphere, and thus promote commerce, it has been suggested that an international sanitation commission be established. It is not a new project, for it has been advocated at nearly every meeting of American medical associations that has been held in late years, and the subject is to be again discussed at the Pan-American Congress in the City of Mexico. Dr. Walter Wyman, supervising surgeon general of the Marine Hospital service of the United States, prepared a letter in English and Spanish giving his views on the organization of such a commission.

After speaking of the great financial loss and the mortality that result from yellow fever and other diseases that are prevalent in cities where no sanitary precautions are taken, Dr. Wyman shows the efficiency to be obtained by a concentrated effort against these diseases by the governments of North and South America. He suggests that harbors receive improvements in sanitation, sewers be laid, the soil drained, the streets paved and buildings be purged of infection.

To accomplish all these necessary measures, he proposes that an international sanitary commission be elected, to consist of five members, each from a different country. The Bureau of American Republics should appoint these men for a period of one year. That they may be able to view the questions for decision in all lights, one shall be a diplomat, one a lawyer, one a physician and sanitarian, one a sanitary engineer, and the fifth a commercial representative. Whenever the five are investigating any seaport or town, there shall be added to this number two representatives of the nation in which the investigation is being held, who are to be appointed by the pres-

ident of that nation. These, of course, to serve only in their own republic. The salaries and expenses of the seven to be paid through the bureau, which shall determine the salaries, audit accounts and divide the expenses among the governments entering into the agreement.

The duties of the international commission shall be briefly as follows: By an inquiry of a commercial and statistical character, the five shall determine upon a list of cities to be visited to improve the sanitary conditions. To visit the cities in order of greatest commercial necessity and make a report on the sanitary measures considered necessary. One copy of the report shall be sent at once to the president of the republic in which was held the investigation, the other filed at the Bureau of American Republics.

It shall be the duty of the president receiving the report to take such action as is in his power to put into operation the measures recommended by the seven commissioners. One year from the date of the report it shall be the duty of the Bureau to ascertain if the said measures have been carried out as suggested by the committee of seven and, if they have not been so undertaken or attempts made to accomplish them, then it shall be the duty of the Bureau to notify the nations in the agreement and each of the nations shall immediately impose upon vessels coming from said port additional taxes and duties upon specified imports and at certain percentages above the import duties imposed upon vessels not under the ban. If no tax is ordinarily imposed by a nation upon such imports, a tax shall be imposed upon all merchandise equal to the highest tonnage tax and duty imposed by any of the nations in the agreement. These taxes and duties shall be imposed until the sanitary work has been completed.

FIRE, WATER AND POLICE ITEMS

NEGRO CONSTABLE.—In return for the many little favors that Cyrus Harper, a negro village hackman, had done for them, the yachtsmen and wealthy residents of Larchmont-on-the-Sound, N. Y., elected him constable on the Republican ticket. Harper ran on the same ticket with a member of the Larchmont Yacht Club, who was elected Supervisor of the town of Mamaroneck, and ran ahead of the Supervisor by nineteen votes.

FIRE FROM STRAYING CURRENTS.—The quarterly fire report of the Electrical Bureau of the National Board of Fire Underwriters has been published and shows the many fires that are due to the going astray of the electric current. Some of the fires could not be foreseen, but the majority of them were due to ignorance on the part of the workmen in putting up the wires, or to carelessness on the part of those having charge of the work after completion. One fire was caused by laying an incandescent lamp on a pile of blankets. Eight cases of crosses between telephone wires and those carrying high potential currents that were reported showed the necessity of putting such wires under ground.

ORDER OF "THE BRONZE CROSS."—The Police Board of Jersey City, N. J., have decided that a bronze cross shall be given, at the discretion of the board, to policemen who distinguish themselves by saving life, by the brave arrest of desperate criminals, or by any act that proves their vigilance, courage and faithfulness. The cross will be suspended from a bar which will be inscribed "The Bronze Cross." In the center of the cross will be a representation of a policeman's shield and the cross is to be worn on the right breast. A certificate will also be given the men with the cross. Bronze cross men will be considered honor men and worthy of special trust, but any flagrant violation of the rules will result in the forfeiture of the cross.

SUBJECTS FOR DISCUSSION WANTED.—The International Association of Municipal Electricians, through its secretary, Frank P. Foster, has sent out a request to municipal electricians, asking them to suggest subjects for discussion at the meeting of the Association at Richmond, Va., next year. The executive committee will meet at Corning, N. Y., December 14 to select and assign subjects for papers. The officials are requested to attend the meeting and discuss

the subjects, and, if they are not already members, to join not later than the next meeting. Subjects for papers will be assigned to the authors not later than January and it is requested that subjects be submitted to the secretary by November 25th. The association has been in existence for six years and is composed of men who have the care of electrical interests in cities.

LONDON'S OLD WATER PIPES.—During the tearing up of Argyll street recently, there was brought to light some of the old pipes that were formerly used to supply the city with water. The sections of these pipes look like huge dismounted cannon and were made of elm trees, cut in lengths, with the bark left on, drilled through from end to end and fitted together. Speculations have been made as to their age, but this is not easy to decide. It seems probable that they are the original pipes laid down when the street was first built, which would place their age at about 200 years. Inasmuch, however, as the underground arrangements of London were, until very recently, of a primitive type, the pipes may not be so very old. For instance, it was as late as 1853 that an outbreak of cholera occurred because of the overflow of a cistern into a well that the people of this very district were using.

WATER SUPPLY FOR MEXICO.—The City of Mexico, Mexico, is soon to have a new water supply. The water is to be drawn from the Almoloya springs about forty miles southwest of the city and six miles southeast of Toluca. The electrical equipment will be supplied by the General Electric Company and the Stanley Electric Manufacturing Company. The engines will be built by the Worthington people and the Pelton Wheel Company will furnish the water wheels. It is estimated that the supply will be 528,35 gallons per second and will be carried over the mountains by pipes, canals, and the use of pumps. To obtain a gravity fall to the city, the water must be pumped to a height of 1,456 feet, requiring 27,000 horse power in this work. A portion of the energy to operate the pumps will be obtained from the falls of the Malinaltenanco River, which will supply 17,500 horse power, partly for the pumps and partly for street lighting, electric railways, etc., in the City of Mexico. Three years is the time estimated for the completion of the work, when the city will have a daily water supply of 40,000,000 gallons at an expenditure of about \$6,000,000 American currency.

FIRE EXHIBITION AT BERLIN

DURING the past summer there was held at Berlin, Germany, a large and attractive exhibition of fire apparatus in which many nations were represented. The exhibition was held in a park in which were buildings containing the apparatus. Amsterdam, Berlin, Buda-Pesth, Venice, Florence, Milan, Lucerne and Vienna were represented by numerous kinds of fire carts, engines, trucks and tenders and several of them were hitched to horses of wood. There was a complete representation of Russian firemen and the departments of most of the European countries were shown by wax works, wooden figures, apparatus or detachments of men who gave exhibition drills. The uniforms showed quite a diversified assortment of colors and material; black, dark and light blue, tight and loose fitting garments were all represented. Of the many fire escapes shown that from Vienna was very unique but effective. It is a strip of canvas, about 100 feet long by nine feet wide, in the form of a shoot. It is rigged on a spreader at the top and is held by the firemen at the bottom. Amsterdam showed escapes on the telescopic pattern which are mounted on

wagons and thus taken to the fire. Berlin uses the hook ladder and Buda-Pesth the pompier ladders which the firemen use with great skill. The Diesel Motors, for fire purposes, first shown in 1898, attracted great attention. The chief claims that are made for superiority for these motors are their smokeless running, the complete absorption of material and the small space they occupy. A unique exhibit was that of a German glass manufacturing firm. This was a house made entirely of glass plates which rendered it fireproof. Many drills were given of the apparatus and crews at the exhibition and the German ambulance drills were of great interest. Many of the Berlin firemen are instructed in the "first aid to the wounded" and prove very efficient in case of accident. Demonstrations were made with the double skin coats of the Berlin firemen which can be filled with water from the hose and when the coat is overfilled the water escapes from a valve in the helmet and flows over the fireman. A demonstration was given to show that burning oil, etc., could be best extinguished by putting chopped straw upon it.

EXPERIMENTS WITH FORMALDEHYD AS AN INSECTICIDE

HERETOFORE mosquitoes have been considered as a necessary nuisance co-existent with warm weather and as the subject for jokes in the funny papers. Recent investigation has branded them as the most dangerous as well as the most common of domestic pests.

Many experiments have been made with a view to determining the best methods of exterminating the insects and in Bulletin 6 of the United States Hygienic Laboratory, Mr. M. J. Rosenau, the director, tells of his work in the disinfection against mosquitoes with formaldehyd gas.

The mosquitoes used for experimental purposes were good specimens of the *Culex pungens* raised in the laboratory, of both sexes and from one to seven days old. They were exposed in battery jars covered with gauze and in small pill boxes with gauze lids, and in the former were placed loosely bits of toweling and paper both dry and wet, so that the insects could have places to hide as in outside conditions. It was found that the mosquitoes would always hide in the most remote places, thus escaping the stronger percentages of the gas. In the pill boxes the gas was able to penetrate to the insects in full strength.

To compare the germicidal with the insecticidal properties of the gas, cultures of bacteria were placed in other pill boxes exposed under the same conditions as those containing the insects.

Formaldehyd gas readily enters into combination with the protoplasm of the lower forms of vegetable life, which makes it a very good germicide, but it is not toxic to higher forms of animal life. It will kill mosquitoes if it comes in contact with them in sufficient concentration and for a sufficient length of time. If exposed directly to the gas they die shortly, but such conditions cannot be obtained at all times, as the mosquitoes hide under curtains, etc., in rooms and thus escape the strong percentage of the gas. To succeed, therefore, in killing mosquitoes in a closed space or room, with formaldehyd gas, the following requirements are necessary: A large volume of gas be liberated quickly so that it may diffuse to all parts of the room in sufficient concentration; the rooms must not have cracks where the insects can get the entering fresh air; the room must not have drapery, clothing, bedding, etc., in the folds of which the insects can hide.

Four methods of evolving formaldehyd gas were used by Mr. Rosenau in his experiments, viz., the sheet method, the Kuhn lamp, the Trenner-Lee formaldehyd disinfecter, the autoclave.

The sheet method was applied by hanging sheets in a room and spraying a 40 per cent. solution of formalin upon them. The time of exposure was six hours. From this experiment it was found that all the bacteria and some of the spores were killed, but the folds of cloth in the jars protected the mosquitoes. The time of exposure was then lengthened to twenty hours and the insects placed in pill boxes with no cloth under which to hide and cultures of bacteria placed alongside of them. Those insects thus directly exposed all died. Those that had been placed in the pockets of a coat hung

on the wall and under layers of damp toweling escaped, although the gas penetrated sufficiently to kill the bacteria and spores alongside of them.

The Kuhn lamp operates upon the principle of dehydrating methyl alcohol into formaldehyd. The vapor of the lamp is passed over incandescent platinum in a state of fine subdivision upon perforated asbestos discs. In the first experiment, forty ounces of wood alcohol was consumed in the lamp and the time of exposure was twenty hours. The mosquitoes and bacteria were placed in similar boxes side by side. The gas killed the bacteria under layers of toweling and in the pockets of the coat, but did not affect the insects.

Another trial of the lamp was made in a small closet and about seventeen ounces of alcohol was consumed, the time of exposure being twenty hours and the insects and bacteria similarly exposed in pill boxes. Despite the excessive amount of the gas, some of the mosquitoes under layers of damp toweling still lived.

With the Trenner-Lee formaldehyd disinfecter the gas was generated from its watery solution, plus 1 per cent. of glycerin, by distillation from a retort without pressure. The first trial was made in a room, as before, and twenty ounces of formalin, with 1 per cent. of glycerin, were distilled. The room was closed for six hours. Nearly all the insects escaped under this short exposure. When lengthened to twenty hours' exposure, more of the insects were killed, but not all. The third trial was made in the closet, mentioned before, and five ounces of formalin were distilled and left twenty hours. The insects in the pockets of the coat and under towels were not affected by the gas.

The fourth method used in evolving the gas was by means of the autoclave. Formalin, mixed with a neutral salt, is heated in a retort under a pressure of forty-five pounds to the inch. In the room, twenty ounces of glyco-chloro-formol were used. This is a mixture of 20 per cent. calcium chlorid and 10 per cent. of glycerin. The time of exposure was twelve hours. Very few of the mosquitoes were killed. In the second trial the exposure was short and the percentage of gas high. About sixty-five ounces of the glyco-chloro-formol solution was used under a pressure of sixty pounds. The time of exposure was only two hours and fifteen minutes. As in the other trials, wherever the insects could find hiding places, the gas did not kill them. Another trial was made with a lower pressure and an exposure of nineteen hours. Under these severe conditions most of the mosquitoes were overcome. The only survivors were those that had been hid away under many folds of wet toweling. Therefore, with the autoclave, the time of exposure is an important element in the experiment. Large percentages of the gas will not penetrate in a short time.

Thus from these experiments it is seen that formaldehyd gas is a feeble insecticide. It will kill them if brought in direct contact, but in practice this is not easy to do, because of the many places in which they have to hide.

CURRENT LITERATURE ON MUNICIPAL TOPICS

Reviews of Some Important Books—What the Magazines and Reviews Have to Say About Civic Affairs—Municipal Reports Received

BOOKS

The Civil Service Year Book for 1901 is better than ever and will prove as useful as it always has been to those who are candidates for English civil service positions. An index has been added this year that renders it of more service as a reference manual. The greatest care has been used in obtaining the latest information and that given can be relied upon as accurate. A valuable section of the work is Sec. IV, in which are given the latest examination papers at open, limited and departmental examinations, and, in addition, the examination papers published in 1900. To enumerate all the many valuable things the book contains would be impossible, but 50 cents will bring it to speak for itself. Published by Sheppard & St. John, 76 Clerkenwell Road, London, E. C.

If any information is needed about the accounts of the tramways, omnibuses and electric railways of Great Britain, a copy of *Duncan's Manual for 1901* will supply the need. In addition to those companies in Great Britain, all companies in the colonies and foreign countries that are registered in England are included in this book. A feature that renders the work especially valuable is the fact that the accounts of the companies are shown for two years so that an idea can be obtained of the progress made. At the end of the book is a directory of officials, engineers, etc., of the corporations that are included in the volume. Published by T. J. Whiting & Sons, Ltd., 7a South Place, London, E. C. Price, cloth, 5 shillings.

In the United States to-day there are few books that the candidate for the position of sanitary inspector can obtain to learn the things necessary for him to know if he would become successful. Of these few books on the subject of sanitation, the *Handbook on Sanitation*, by George M. Price, M. D., Medical Sanitary Inspector of the Health Department of New York City, is a text-book that will give the beginner and the expert alike information that he could not obtain elsewhere without considerable research. Dr. Price's experience makes him competent to speak of the subjects under consideration and he has adopted a happy method of imparting that information. In addition to the chapter heads into which the book is divided, wherever in each chapter a new matter is taken up the paragraph commences with heavy-faced type, so that in looking for a subject the eye is instantly attracted to it. Then, too, this arrangement makes the book a sort of expanded dictionary and, consequently, of especial advantage to a beginner who will not have to wade through a chapter to find out all about a thing. It is given under the proper head in clean and concise language best calculated to impress it on his mind. The work is divided into four parts. Part I treats of Sanitary Science, with chapters about air, soil, ventilation, water, sewers, plumbing, etc., giving the information that an inspector or student would need to know. Part II deals with Sanitary Practice, as applied to tenements, private houses, etc., and the different characters of inspection work that is met with in a city or town. This is carried out more fully in Part III on Sanitary Inspection. Here instruction is given as to the inspection of tenements, rules for inspectors, extracts from civil service examinations and a mass of useful information for sanitary engineers. The methods of disinfection as recommended by the Health Department of New York City are given, also the New York Tenement House Law, and the regulations for plumbing. There are abundant illustrations of methods and appliances in the field of Sanitary Inspection and these serve to clear up any possible vagueness in the text. Published by John Wiley & Sons, New York. Price, in cloth, \$1.50 net.

Some Questions of Larger Politics, by Professor Edwin Maxey, D. C. L., LL. D., is the name of a collection of thirteen essays on questions of Political and Social Science that have appeared from

time to time in the magazines. Grouping them thus in book form renders it possible to have conveniently at hand the opinions of Professor Maxey on subjects of such interest and importance to good citizens. His essay on the "Speakership" is a clear defense of the powers that have accrued to that officer, not first attributed to him by the originators of our government. The "Race Supremacy Question," although appearing in the *Self-Culture Magazine* for February, 1900, is still of great interest at the present time on account of the continuance of the war in South Africa. In this Professor Maxey does not agree with most of the opinions that are expressed in the press on this struggle, for he maintains that the Boer is out of joint with the times, is unprogressive both in manner of living and ideas of government. As isolation is the only hope for such people, and as the great riches of their country renders such isolation impossible, the Boers must catch up with the world in progress or go to the wall. In India and Egypt the justification for English control is not in the refinements of international law, but in the things that they have done for the countries; they have placed things in a better condition than they found them. In South Africa the results will be the same when once the control passes into English hands. Other essays are on the "Anglo-Russian Relations," the "Suffrage Question," the "Eastern Question," the "Election of United States Senators," the "Eight-Hour Day by Legislation," and the "Natural Right of Self-Government." The Abbey Press publishes the book at 114 Fifth avenue, New York, and the price is \$1 per copy.

Poverty and wealth represent the two extremes of the social conditions in life. How these extremes come to be, and what are the causes for their existence, has been troubling the minds of social students for many years, and the causes assigned and the remedies suggested are as widely different as the subjects under discussion. Mr. George H. Hubbard in *The Why of Poverty* has endeavored to get at the reasons of its existence and the causes he gives are, in many instances, far different from many noted economists. He seems to have hit the nail on the head very often, the noted economists to the contrary. He says that the poor are of all classes, and maintains that there is, in America, no line between the so-called "wealthy classes" and "poor classes." The poor are not a separate class nor are they all working people. Poverty, he says, is individual and it is this fundamental truth that so many writers miss in their search for causes. They look for them in an imperfect system of social organization, or an unequal division of the profits of labor. There are, however, general causes to which can be traced the poverty of the individual. Liquor, tobacco, expensive amusements, ignorance, extravagance, war, strikes and speculation are the main reasons he assigns for poverty. To the first he rightly attributes the most cases of poverty and degradation. Nine hundred million dollars is spent every year by the American people for intoxicating liquors, or a yearly tax of \$20 for every man, woman and child in the country. Were this tax imposed for education or equally beneficent work, the people would rise up in revolution, yet the people grow weary of hearing these facts about liquor, and are indifferent to them. The poor man does not want to be told that his own intemperate habits are the cause of his poverty.

Mr. Hubbard attributes to tobacco the next greatest cause of poverty, and claims that if the men and women engaged in its preparation were to turn their attention to some other pursuit their labor would be more profitable. He claims that they are non-producers. In this it would seem that he has erred unless he defines the word "producer" as applying only to those persons who supply absolute necessities. Others, however, will not agree with him there, as the usual meaning assigned to a "producer" is one who produces that which supplies a want, and certainly tobacco is a want to judge from the figures that Mr. Hubbard gives in regard to the number of persons that use it. That their production may not be a necessity

there is no doubt, but it is none the less a want, and those that administer to that want are producers. In several other places, as in this, Mr. Hubbard seems to hold a different definition of words than is usually assigned to them by others.

In ninety-nine cases out of a hundred poverty is the result of negligence in trifling matters rather than any great wrong or injustice. This is simply another way of putting the old adage, "Take care of the pennies and the pounds will take care of themselves," and there never was a truer sentence spoken. Mr. Hubbard rightly asserts that the poor are the greatest offenders in this regard. So, too, the American sin of extravagance is more often found among the so-called "poorer classes" than elsewhere.

In his chapter on "The Penalty of Ignorance," the author brings out the fact that ignorance is not confined to a lack of book knowledge, and states that "learned ignorance" is no less disastrous than it is common. He says that the art of spending is no less essential to comfort and wealth than the art of learning, and gives several well known instances of this recognized fact. The obstinacy of ignorance and the blindness with which it opposes the best designs, are really marvelous. Many instances have been given lately of these facts in strikes that have occurred in this country. Notably that in the National Cash Register Company's works, where all the efforts made by the company for the good of the employees were set at naught by the men themselves.

In treating of the aversion to manual labor, the author criticises writers who, insisting on the true nobility of labor, exhort the laborer to diligence in order that he may rise above work. In this it would seem that he misunderstands them. They do not exhort men to rise above work in the abstract, but above menial labor, that they may not always be servants, but masters. Later on he states that a master is as much a producer as those he directs and is entitled to higher pay because of the greater amount of work he does, although he performs no manual labor.

War seems to arouse the ire of Mr. Hubbard as being an entirely unnecessary and wasteful pursuit. He calls it a "tax on barbarism" and ascribes to its results the greater number of the great army of tramps and paupers. He states that there is scarcely a hamlet in the country in which there is not a home of poverty due to the War of the Rebellion. It is true that war unfits some for peaceful labor, but these would not be so inclined anyway, and the great number of the soldiers that took part in the war he mentions returned to their homes after a struggle and took up again the work of the farm or trade in a manner that has never ceased to cause the wonder of the old world. It seems necessary that there should be some consumers, and not all producers, as the author seems to imply from his arguments. It is a well known fact that America produces many times the amount that it can use within its borders, and is able to supply the rest of the world with its surplus. Now what would be done with this surplus, and consequently the occupation of many Americans, if all the men in the European armies should turn to direct production?

In the majority of cases the author, as has been said before, hits the nail on the head. Instead of searching for the causes of poverty among the different systems of governments or ascribing them to "Free Trade," "Protection," or "The Single Tax," Mr. Hubbard has applied many old maxims and finds in them the true reasons for the poverty of the individual, for he asserts that poverty is individual and well maintains his assertion. Published by the Abbey Press, 114 Fifth avenue, New York City. 12mo, cloth, \$1.

PERIODICALS

The Puritan City is the subject of an article by Hon. Thomas N. Hart, Mayor of Boston, Mass., showing how State regulation of municipal finances failed and how municipal ownership means higher taxes. *The National Magazine*, Boston, Mass., December, 1901. Price, \$1 a year; 10 cents a copy.

The Outlook for November 16 publishes the account given by its special commissioner to Cuba, Mr. Thomas R. Dawley, Jr. It is called *Havana After Three Years* and sets forth the lethargy that has come

upon the Cubans ever since the Spaniards were forced to depart. New York, N. Y.; \$3 a year; 10 cents a copy.

Charities for November contains interesting items under the general caption of *Dependent and Neglected Children* from all over the world as to the work that is being done in their behalf. Some account of the work of the *Charity Organization of New York City* is also included in this issue. New York, N. Y.; \$2 a year; 25 cents a copy.

The Public Health Record contains two articles of interest to sanitarians and builders. John J. Sullivan tells how to *Install New Water Closets in Old Tenements*, giving designs for their form and arrangement. Dr. G. M. Price contributes a short article on the *Tenement House Problem* in which he points out a few of the more important provisions that should be adopted to secure healthy buildings. New York, N. Y.; \$1 a year; 10 cents a copy.

In the issue of *The Independent* for November 7, Prof. John R. Commons, of the Bureau of Economic Research, writes of the *Municipal Administration of Public Utilities*. It is a plea for municipal ownership of utilities and cities as a successful example of such administration the street cleaning department of New York under Col. Waring. He holds that no one should advocate public ownership unless it includes the referendum, self-governing civil service and State auditing. New York, N. Y. Price, per copy, 10 cents; per year, \$2.

A Plain Description of Tammany, by Arthur Goodrich, is the first of a number of interesting articles in the *World's Work* for November. Mr. Goodrich tells of a few of the methods employed under "Boss" rule in New York City. Charles H. Caffin, in *The Beautifying of Cities*, makes comparison of the beauties of the cities of the world and what forces are working for improvement. Two fundamental facts—the universal seeking after beauty and the tendency of the rich to make others share in their objects of beauty—are the causes that conduce to the beautifying of cities. New York, N. Y. Price, \$3 a year; 25 cents a copy.

The first number of *Country Life in America* was issued in November. Doubleday, Page and Company are the publishers and the magazine promises to be as fine in get up as it is unique in subject. There has been a great demand for the first edition, and there is no doubt but that the paper will be as popular as *The World's Work*, the other monthly publication of this firm. There is an article on the *Abandoned Farms in New England* by the editor, L. H. Bailey, of Cornell; the *History of the Frog*, with remarkable illustrations of its life from a tadpole; articles on fruit, lawns, and practical hints about the garden. New York, N. Y.; \$3 a year; 25 cents a copy.

The North American Review for November presents the views of Robert A. Pinkerton, one of the heads of the famous detective bureau of that name on *Detective Surveillance of Anarchists*. Mr. Pinkerton claims that the United States Secret Service will not be able to cope with the problem of exterminating the anarchists. Politics, he says, have greatly handicapped the service, and it will take a detective agency in which these influences have no effect to seek out the leaders of Anarchy, just as the leaders of the "Mollie Maguires" were sought out and brought to justice. In fact the work must be done in the same way and such influence must be brought to bear on some of the Anarchists that they will become spies on their neighbors. New York, N. Y. Price, \$5 a year; 50 cents a copy.

Under the general head, *The New York Municipal Campaign*, there are sketches of Seth Low and Edward M. Shepard, by Dr. James H. Canfield and George Foster Peabody respectively, and an article on *The Issues of the New York Campaign*, by Dr. Milo Roy Maltbie. Clinton Rogers Woodruff tells of the efforts that were made to redeem Philadelphia in *The Philadelphia Campaign Against "Machine" Rule*. Mr. Woodruff shows how the "ring" turned aside Mr. Frederick Rothermel, Jr., as a candidate to succeed himself in the office

of District Attorney, because he would not be controlled by the bosses. The Union Party has grown out of the condition of affairs in the Quaker City. *The American Review of Reviews*, New York, N. Y., November, 1901. Price, \$2.50 a year; 25 cents a copy.

In the November issue of *Gunton's Magazine*, in *The Human Waste of a Great City*, Walter H. Hawley advances the opinion that children should not be put in the asylums and homes to which orphans and other children are sent by the city because, among other bad effects, the routine necessary to the institutions will destroy all originality in a child and thus make him unfit to become a self-supporting citizen. The remedy for this system is for the cities to keep children out of such institutions and compel parents to support their children, lending what aid is necessary. There will always be a mass of human waste that must be carried by the strong, but this should not, as under the present systems of charity, be added to when the city can prevent it. New York, N. Y. Price, per year, \$2; 20 cents a copy.

The Government and Good Roads, by Hon. Martin Dodge, Director of the Office of Public Road Inquiries at Washington, is an article of some 3,000 words on the part that the Government has taken in furthering the cause of good roads. He reviews the way in which the Government from building entire roads, now only disseminates literature and information, and gives the services of expert road builders to all who desire to undertake road-building on a scientific basis. Walter S. Allen, in *Taxes on Street Railway Franchises*, discusses the right and wrong way of making corporations pay for the use of the streets. He holds that the corporations should be fostered, exempted from unnecessary burdens, but compelled to pay for the privileges they enjoy by being forced to give low fares. Thus those that are compelled to travel on them will have the benefits of cheap transportation and the companies will be able to extend their lines in more directions with consequent conveniences to the people. *The Forum*, New York, N. Y., November, 1901. Price, \$3 a year; 35 cents a copy.

The Problem of Tuberculosis is the subject of Harold R. White's contribution to the *Westminster Review* for November. Mr. White calls attention to the fact that, while great precautions are taken against small-pox, etc., consumption, on account of its insidious nature, does not attract the attention it deserves. He speaks of the mistaken idea that climate in itself is a cure for the disease, and states that the opinions of the great physicians agree on these essentials for a cure, viz., an open air life, proper diet and rest. The invalid must not think that as soon as he gets in a climate of pure and rare atmosphere that he is going to get well without the assistance of a physician. High altitudes are not beneficial to consumptives, because of the strain there is on the breathing. He says that it has been amply proved that weather has little to do with the cure, nor is the so-called "roughing it on a ranch" anything but detrimental to the health, unless, of course, all the best food and physician's care can be readily obtained. New York, N. Y.; \$4.50 per annum; single copy, 40 cents.

FOREIGN

In the supplement to *The Surveyor* of October 25, there is a description of the *Wimbledon Public Baths*. London, Eng. Price, 3d. a copy.

The Sanitary Record and Journal for October 24 has an account of the conference of the Sanitary Institute on *Water Supplies and River Pollution*. London, Eng. Price, per year, 12s. 6d.; 3d. a copy.

The Municipal Journal, issue of November 1, has an account of *A Park for Public Buildings*, a unique scheme at Cardiff, Eng. There is also an account of the new works of the *Hackney (Eng.) Electric Lighting Plant*, another municipal lighting system. London, Eng. Price, 1d. per copy.

H. G. Tyrrel, C. E., writes in the *Canadian Engineer* on the *Sanitary Drainage of Houses and Towns*. This is the first of the two parts into which this article is divided, and deals with the ventilation and flushing of sewers, and the dry conservance and Goud systems. It will be concluded in December. Toronto, Can., November, 1901, \$1 a year; 10 cents a copy.

MUNICIPAL REPORTS

The municipal register of the city of Bridgeport, Conn., for 1901 has been received. It is neatly bound in cloth and in every way creditable to the city.

We have received the twenty-eighth annual report of the secretary of the State Board of Health of Michigan for the year ending June 30, 1900, showing the work that has been done by the Board for a year and illustrated with many tables and diagrams.

The annual reports of the city of Nottingham, Eng., for 1899 to 1900, have lately come to hand. This is a cloth bound, leather backed volume in which have been incorporated all the reports of the city issued by its different departments, etc., the pages renumbered and an index of all the reports bound in with them in the front. With this came a similarly bound copy of the minutes of the council for 1899 to 1900.

Mr. John Tremayne Lane, the City Treasurer of Bristol, England, has sent us a copy of his report or abstract of accounts for the year ending March 31, 1901, and in every way it is an estimable work. Besides the extracts of accounts, etc., supplements are added to the report showing in a statement the accounts of committees and other bodies that are separate adjuncts of the city's administration. The report is bound in boards with cloth back and the typographical work is well executed.

An interesting report that has come to us is that of the Liverpool Self-Propelled Traffic Association on the third Liverpool trials of motor vehicles for heavy traffic, held on June 3 to 7, 1901. Although but paper bound, the report is elegantly gotten up. The paper used is of the heavy, coated kind, such as is best calculated to show up well the many illustrations of automobiles, and many instances in which they were photographed while in use. Engineers' diagrams of the autos and tables showing speed, strength and other tests are numerous.

RIDER'S "LITTLE ENGINEER"

...IS...

A POCKET-BOOK FULL OF INSTANT ANSWERS

Relative to about 200 subjects, in plain English, without use of formulae, for

EVERYBODY INTERESTED

In, or having to do with the design, construction, operation or supervision of water-works, sewers, pavements, roads, engines, boilers, pumps, dams, surveying, curve location, steam, hot water and air heating, buildings, plumbing, fire fighting, insurance, etc., or anything else connected with public works, structures or departments.

It contains 528 pages and 250 tables, is bound in the best red or black flexible leather, with flap cover and gold edges. In most instances it permits an answer without pencil or paper.

PRICE \$3 00

If the purchaser is not satisfied after one month's use it can be returned, if in good condition, and money will be promptly refunded.

Send for Booklet No. 89, containing handy tables taken from and data relative to it.

ADDRESS

JOSEPH B. RIDER, Consulting Engineer
10 WALL STREET, NEW YORK

MUNICIPAL BOND SALES FOR NOVEMBER

**Strong Market—Superior Has Many Bond Suits on Her Hands—Hamilton's Credit Impaired
—Jacksonville's Good Credit**

THE prevailing opinion among bond holders is that the market for municipals is a strong one. There has been a dulness during the past few months, but holders of municipals look for an improvement in values and an increase in business. It was said that the bond offers for November would be in excess of the record for October, but the first three weeks' totals do not justify the assertion. The fall elections in many of the small towns resulted in a favorable vote on bond questions.

Suit has been begun by the holders of bonds of Superior, Wis., because of the failure of the city to pay interest. The bonds were issued in boom days, and the city wants them to be declared specials, but the creditors assert that they are general. The holders of paper represent a total of \$750,000 in bonds, and declare that the bonds are general on the strength of several decisions that have been rendered during the last year. Judgments have been received against the city in which the bonds were declared general, but the Supreme Court may reverse the decisions.

The city of Nashville, Tenn., was unable to sell its bonds at a premium. Nearly \$350,000 worth of bonds were disposed of, being

authorized by a big majority of the voters. To explain the failure of obtaining a premium, the Mayor says that the condition of the market is very different from that in July and September, when the bonds were first advertised for sale. The greatest reason for the decline in the price he ascribes to the attacks that the newspapers made on the credit of the city.

The failure of the city of Hamilton, Ohio, to secure bids on her offer of bonds is attributed to her impaired credit due to the debt of \$1,000,000 and her tax rate of \$32.80 per \$1,000. It was necessary to raise the rate of an offer of \$5,000 street bonds from 4 per cent. to 6 per cent. before they could be disposed of.

Jacksonville, Fla., has come to the rescue of the credit of municipalities. The sale of \$400,000 worth of Jacksonville's 4 per cent. bonds at 107.535 speaks well for the credit of a city that has just risen from its ashes. Fifteen bidders asked for the bonds; both local and outside banks showed their confidence in the city by entering the competition. The subscriptions were greatly in excess of the amount to be issued.

PURCHASER.	PURCHASE.	INT. RATE.	TERM, YEARS.	AMOUNT.	PRICE.
Church, Peter, Buffalo.....	Delano, Minn., Public Park.....	5 per cent. a.	2—4 Ser.	\$1,500	Par.
Chrutchfield, W. F., Local	Fullerton, Neb., Water Extension.....	5 per cent. a.	20	6,000	101.666
Essex County Savings Institution.....	East Orange, N. J., School House.....	5 per cent. s. a.	30	40,000	104.410
MacDonald, McCoy & Co., Chicago.....	Roswell, N. M., Water, Sewer, etc.....	6 per cent. s. a.	20—30 Opt.	35,000	103.857
Montague, R. V., & Co., Kansas City.....	New Barnesville, Minn., School District.....	4 per cent. s. a.	10	4,000	101.375
Newburg Savings Bank	Newburg, N. Y., Sewer.....	3½ per cent. s. a.	1—10 Ser.	3,000	100.166
Sherill, I. W., Poughkeepsie.....	Cohoes, N. Y., Certificates.....	3½ per cent. s. a.	1—4 Ser.	10,685	100.040
Sherill, I. W., Poughkeepsie.....	Niagara Falls, N. Y., Sewer, Series "C".....	4 per cent. s. a.	20	115,000	111.090
Sinking Fund Commissioners.....	New York City, N. Y., Silver Park, Gold.....	3 per cent. s. a.	39	85,000	Par.
Thoburn, Wm.	Almonte, Ont., Electric Light.....	4 per cent. s. a.	30	30,000	100.166
Union Bank, Local	Redlands, Cal., Fire Hall.....	4½ per cent. s. a.	1—11 Ser.	5,500	100.454
Bank of New Baden	New Baden, Ill., School District.....	5 per cent. a.	2—10 Opt.	2,700	100.850
Bank of Oglethorpe.....	Oglethorpe, Ga., School House.....	5 per cent. s. a.	30	5,000	103.000
Blodget, Merritt & Co., Boston.....	Mt. Vernon, N. Y., Sewerage Loan.....	3½ per cent. s. a.	28	40,000	102.650
Citizens' National Bank, Local.....	New Philadelphia, O., Sewer.....	6 per cent. s. a.	8½ Avg.	7,000	115.871
Firemen's Pension Fund.....	Youngstown, O., Grading	5 per cent. s. a.	2—6 Ser.	1,825	105.764
Firemen's Pension Fund.....	Youngstown, O., Sewer	5 per cent. s. a.	2—6 Ser.	640	105.579
Firs National Bank, Local.....	La Mars, Ia., School.....	4 per cent. s. a.	½—3½ Ser.	4,000	100.250
First National Bank, Local.....	Nashville, Tenn., Electric Light Plant.....	4 per cent. s. a.	14½—19½ Opt.	143,000	Par.
First National Bank, Local.....	Nashville, Tenn., Trunk Sewer, etc.....	4 per cent. s. a.	25	200,000	Par.
Kane & Co., Minneapolis.....	Bird Island, Minn., School District.....	5 per cent. a.	10	5,000	102.800
Sherill, I. W., Poughkeepsie.....	Utica, N. Y., Registered Paving.....	4 per cent. s. a.	1—6 Ser.	46,687	100.294
Skinner, M. F., & Co., Boston.....	Greenfield, Mass., School.....	3½ per cent.	7½ Avg.	36,000	102.073
Snow, Wm. W., Local	Hillburn, N. Y., Health Expense.....	5 per cent. a.	1¼ Avg.	2,000	Par.
Local	Janesville, Wis., City Hall and Library.....	4 per cent.	7 Avg.	65,000	Par.
White, Geo. C., Jr., New York.....	Yonkers, N. Y., Registered School.....	3½ per cent. s. a.	22 1—3 Avg.	13,000	103.660
City Sinking Fund.....	Buffalo, N. Y., City.....	3 per cent. s. a.	1	11,107	Par.
Kleybolte, Rudolph & Co., Cincinnati.....	Lorain, O., Street Improvement.....	4 per cent. s. a.	6 Avg.	31,000	100.321
Noble, H. W. & Co., Detroit.....	West Bay City, Mich., Water Works.....	4 per cent.	30	25,000	Par.
Unknown	Prescott, Ont., Electric Light.....	4 per cent.	30	6,000	105.000
Local	Portage, Wis., Water Works.....	3½ per cent.	20	42,500	Par.
Estabrook & Co., Boston.....	Fall River, Mass., Highway.....	3½ per cent. s. a.	10	15,000	102.851
Harris, N. W., & Co., Chicago.....	Fort Wayne, Ind., City School.....	3½ per cent. s. a.	15 1—5 Avg.	125,000	102.172
Spitzer & Co., Toledo	Lawrence, Kan., City Improvement.....	5 per cent.	1—10 Ser.	70,407	100.500
Blodget & Merritt, Boston.....	Lexington, Mass., Water Works.....	4 per cent. s. a.	30	10,000	112.570
Spitzer & Co., Toledo	Bradford, O., Water Works.....	5 per cent. s. a.	31	10,000	112.170
Hahn, Geo. H.	Almont, N. Y., School.....	4 per cent.	10	15,000	104.670
Snitzer & Co., Toledo	Colorado Springs, Colo., City.....	4 per cent.	10—15 Opt.	69,000	102.053
Kleybolte, Rudolph & Co., Cincinnati.....	Newherry, S. C., Improvement.....	4½ per cent. a.	20—40 Opt.	25,000	101.000
Hayes, W. J., & Sons, Cleveland.....	Sandy Hill, N. Y., Sewer.....	3½ per cent.	16 3—4 Avg.	62,500	101.816
Lamphrech Bros. Co., Cleveland.....	Edgewood, Pa., Sewer and Street.....	4 per cent. s. a.	25 5—6 Avg.	10,000	100.250
Kleybolte, Rudolph & Co., Cincinnati.....	Lorain, O., Street Improvement.....	4 per cent.	6 Avg.	31,000	100.322
Trowbridge & Niver Co., Chicago.....	Bemidji, Minn., School District.....	5 per cent. s. a.	10	12,000	102.558
Kleybolte, Rudolph & Co., Cincinnati.....	Le Mars, Ia., Sewer.....	4 per cent. s. a.	20	20,000	100.520
First National Bank, Local	Conneaut, O., Electric Light.....	4 per cent.	2½ Avg.	4,000	100.250
Hahn, Geo. M., New York.....	Liberty, N. Y., Sewer.....	3½ per cent.	6—15 Ser.	10,000	100.070
Everitt, J. D., & Co., New York.....	Little Falls, N. J., School.....	4 per cent.	5—10 Ser.	18,000	101.430
Seasongood & Mayer, Cincinnati.....	West Covington, Ky., Paving.....	4½ per cent. a.	5	8,500	101.176
Dick Bros. & Co., New York.....	Sharpsburg, Pa., Water and Light.....	4 per cent. s. a.	9½—19½	30,000	103.666
Hartley, J. F., Cairo	Caruthersville, Mo., Water Works.....	4 per cent. s. a.	10—20 Opt.	26,000	100.019
Port Chester Savings Bank	Port Chester, N. Y., Paving.....	3½ per cent. s. a.	2½ Avg.	3,165	100.001
Swan & Barrett, Portland	South Portland, Me., Sewer.....	3½ per cent. s. a.	5 1½ Avg.	10,000	100.910
Townsend, Scott & Co., Baltimore.....	Jacksonville, Fla., Water Works.....	5 per cent. s. a.	22½	400,000	107.535
Wilson, Colston & Co., Baltimore.....	Douglas, Ga., School.....			5,000	106.700
First National Bank, Barnesville	Escanaba, Mich., Sewer.....	4 per cent.	20	15,000	Par.
Devitt, Tremble & Co., Chicago.....	Newburyport, Mass., Sewer.....	3½ per cent.		46,000	105.750
Sinking Fund Commissioners.....	Carleton, N. B.	4 per cent.	11—20 Ser.	10,000	100.210
Five Cent Savings Bank.....	Halifax, N. S., Refunding and Water.....	4 per cent. s. a.	25	120,000	100.935
Central Canada Loan & Savings Co., Toronto.....	Balston Spa, N. Y., Water.....	3½ per cent. s. a.	5 1—5 Avg.	7,500	Par.
Central Canada Loan & Savings Co., Toronto.....	Allegan, Mich., Water Works.....	4 per cent. s. a.	8½ Avg.	15,000	100.160
Coons, L. S., Local	Niles, O., Water Works Improvement.....	5 per cent. s. a.	1 1—12 Avg.	5,000	100.200
First National Bank, Chicago	Niles, O., Church Street Improvement.....	5 per cent. s. a.	1—5 Ser.	4,000	100.500
First National Bank, Local	St. Clairsville, O., Electric Light.....	5 per cent. s. a.	6 Avg.	5,500	104.509
Imperial Bank, Local	Lakeland, Fla., School.....	6 per cent. s. a.	5—20 Opt.	10,000	Par.
Kean, S. A., Chicago	Clearfield, Pa., School.....	3½ per cent. s. a.	8—30 Opt.	16,000	100.250
Local	Pittsburg, Kan., School.....	4 per cent.	20	35,000	Par.
Patmor, James	Mobile, Ala., Paving.....	6 per cent. s. a.	15 Opt.	65,000	Par.
People's Bank	Massachusetts, State	3 per cent. s. a.	40	1,000,000	Par.
Unknown	Yonkers, N. Y., Assessment.....	4 per cent.	1¾	9,000	100.470

COMPARATIVE BIDS FOR CONSTRUCTION WORK

SEWERAGE SYSTEM

HAVANA, CUBA.—The following bids for constructing the sewerage system were received:

Sections.	Estimated cost.	McArthur & Co.	Havana Contractor's Co.	Pan-Amer. Const. Co.	McGivney & Rokeby.
East side marginal.....	\$395,461	\$505,042	\$421,351	\$553,994	\$433,560
North side marginal.....	743,501	986,916	833,538	940,768	929,508
South side high level.....	208,541	282,509	282,355	372,984	294,271
North Matadero.....	190,634	218,504	206,425	274,161	221,234
Matadero drainage.....	436,058	522,723	459,465	484,035	488,742
South Matadero.....	87,390	96,808	99,280	124,778	117,412
Jesus del Monte.....	63,644	73,555	80,696	83,087	86,265
Cerro.....	173,851	199,353	253,314	234,705	281,132
Vedada.....	402,315	474,026	399,595	398,309	456,049
Manholes and connections.....	874,558	910,877	742,617	1,012,394	972,553
Pumping stations and accessories.....	711,935	764,964	650,713	720,809	906,426
Extra work.....	311,437	383,537	354,100	527,150	275,950

SEWER

BOSTON, MASS.—These bids were submitted to the Metropolitan Water and Sewerage Board for section 59 of the High Level Sewer, Milton:

Earth excavation and re-filling 127 in. x 139 in. sewer, 2,568 cu. ft.	Brick masonry, American, 900 cu. yds.	Brick masonry, Portland, 3,000 cu. yds.	Concrete masonry, American, 300 cu. yds.	Concrete masonry, Portland, 3,000 cu. yds.	Spruce lumber in trench in place, 10 M. ft. B. M.	Total.
Jones & Meehan, 1 Beacon St., Boston.....	\$17.00	\$14.00	\$5.00	\$6.50	\$40.00	\$122,656.00
National Cont. Co., 11 Broadway, N. Y.....	16.32	13.45	4.55	5.10	24.00	111,269.76
E. W. Everson & Co., Providence.....	13.50	12.00	4.50	6.00	30.00	107,118.00
Metropolitan Cont. Co., 95 Milk St., Boston.....	13.35	12.75	4.85	5.65	35.00	105,762.80
Bruno, Salomone & Co., 264 Summer St., E. Boston.....	11.50	12.50	5.50	6.50	40.00	102,832.00
H. P. Nawn, Boston.....	12.00	12.00	4.00	6.00	30.00	100,116.00
Lotta & Terry Co., 1001 Chestnut St., Philadelphia.....	8.90	12.70	4.10	4.70	30.00	88,915.20
J. W. Bustin, Syracuse, N. Y.....	8.00	11.65	4.10	4.90	25.00	No bid.
	20,544.00	10,485.00	38,250.00	1,230.00	14,700.00	85,459.00

WATER METERS

CLEVELAND, O.—Bids for water meters were received as follows:

10,000 5/8 inch.	5,000 5/8 inch.	800 3/4 inch.	200 1 inch.	4 6 inch.
Union Meter Co., Columbia Meter.....	\$6.10	\$6.10	\$9.90	\$14.10
	61,000	39,500	7,920	2,820
Union R. P.....	10.00	10.00	14.25	19.00
National Meter Co., Nash Meter.....	100,000	50,000	11,400	3,800
	9.00	9.00	13,50	18.00
Crown Meter.....	90,000	45,000	10,800	3,600
	12.00	12.00	21.00	30.00
Empire Meter.....	120,000	60,000	16,800	6,000
	10.00	10.00	15.00	20.00
Hersey Mfg. Co.....	100,000	50,000	12,000	4,000
	6.63	7.10	9.94	13.26
Pittsburg Meter Co.....	66,300	35,500	7,952	2,052
	6.95	6.95	10.50	14.50
Neptune Meter Co.....	69,500	24,750	3,400	2,900
	7.50	7.50	10.50	15.00
Henry R. Worthington.....	75,000	37,500	8,400	3,000
	9.25	9.50	14.70	20.50
Thompson Meter Co.....	92,500	47,500	11,260	4,100
	No bid.	37,500	12.00	16.00
Permanent Mfg. Co.....	7.20	7.20	9,600	3,200
	72,000	36,000	7,680	14.30
				2,860

PAVING

HAVANA, CUBA.—Bids for paving with brick, asphalt, etc., were received as follows:

	Estimated cost.	Estimated cost. + 25 per cent.	The McArthur Co.	The Havana Contractors' Co.	The Pan-American Construction Co. and M. J. Dady.	McGivney & Rokeby.
Preparing subgrade.....	933,500 sq. m.	\$0.14	\$0.175	\$0.25	\$0.195	\$0.28
Extra haul, 1 kilometer.....	100,000 cu. m.	.232	.29	.37	.32	.30
Concrete in foundation.....	93,000 cu. m.	8.64	10.80	11.00	12.54	8.50
Brick paving and sand cushion.....	488,000 sq. m.	2.825	3.531	3.00	3.71	2.86
Block asphalt paving, mortar bed.....	98,875 sq. m.	4.01 1/4	5.015	5.00	4.78	3.50
Block asphalt paving and sand bed.....	98,875 sq. m.	3.79	4.73 1/4	4.60	4.53	3.50
Sheet asphalt pavement.....	197,750 sq. m.	1.925	2.406	3.00	3.39	3.50
Curbing: Granite, and sand bed.....	42,000 lin. m.	4.504	5.63	5.50	5.82	5.80
Same on concrete bed.....	42,000 lin. m.	5.352	6.69	6.75	6.88	6.30
Bluestone, and sand bed.....	42,000 lin. m.	3.352	4.19	6.00	5.61	5.00
Same on concrete bed.....	42,000 lin. m.	4.20	5.25	7.25	6.71	5.50
Special granite and concrete bed.....	42,000 lin. m.	3.13	3.91 1/4	6.00	5.71	5.50
Circular granite and sand bed.....	940 lin. m.	6.056	7.57	11.15	9.26	7.75
Same and concrete bed.....	940 lin. m.	6.912	8.64	12.50	10.53	8.75
Bluestone, circular, sand bed.....	940 lin. m.	4.328	5.41	10.00	8.95	6.50
Same on concrete bed.....	940 lin. m.	5.176	6.47	11.25	10.00	7.50
Special circular, granite, concrete bed.....	940 lin. m.	4.12	5.15	9.50	6.58	7.50
Resetting, sand bed and bed.....	25,000 lin. m.	.456	.57	.55	1.32	.82
Resetting, concrete bed and bed.....	25,000 lin. m.	1.39	1.73 1/4	1.80	2.74	1.35
Medina sandstone paving.....	25,000 sq. m.	6.60	8.291	6.75	5.29	4.90
Granite block paving.....	25,000 sq. m.	6.36	7.95	6.50	5.00	5.35
Total	\$4,745,893	\$5,932,367	\$6,063,961	\$6,473,642	\$5,713,550	\$5,185,920

GAS STATISTICS IN AMERICAN CITIES

Including Those Having a Population of From 5,000 to 50,000 Given in Order of Population

City.	Population.	Population district supplied.	Annual output in million cu. ft.	Number of meters.	Price.											
					Light.	Gross.	Net.	Fuel.	Gross.	Net.	Candle power.	Per cent. used for fuel.	Number public lamps.	Price per year.	No. hours of burning.	
Middletown, O.	9,215	10,000	15	500	1.10	1.00	1.10	1.00	1.10	1.00	17					
Oskaloosa, Ia.	9,212	11,000	25	425	2.00	2.00	1.50	1.50	1.50	1.50	22	40				
Batavia, N. Y.	9,180	9,000	17	900	2.00	1.50	1.50	1.00	1.50	1.00	20	30				
Keene, N. H.	9,165	10,000	13	650	1.80	1.80	1.80	1.80	1.80	1.80	22	40				
Pasadena, Cal.	9,117	10,000	15	820	2.00				2.00		24	50				
Champaign, Ill.	9,098	16,000	26	1,100	1.75				1.50		18	25	1			
Brunswick, Ga.	9,081	9,000	8	83	2.00				1.50		16	1	147	* 20.00	†	
New Bern, N. C.	9,090	10,000	3	250	2.00				1.50		20					
Lancaster, O.	8,991	10,000	6	350	1.50	1.00	1.50	1.00	1.50	1.50	18		8	* \$24.00	4,000	
Alliance, O.	8,974	9,000	13	450	1.50	1.25			1.50		22	20				
Lincoln, Ill.	8,963	8,962	15	705	1.50	1.40			1.50	1.25	18	20	200		Avg. 3,000	
Willimantic, Conn.	8,937	10,000	6	370	2.00				2.00		22	20				
Boone, Ia.	8,880	12,000	8	505	1.50	1.12 to 1.28			1.50	1.12 to 1.25	22	45	6	* 20.00	2,400	
Elyria, O.	8,791	10,000	21	885	1.20	1.00	1.20	1.00	1.20	1.00	22—24	40				
Owosso, Mich.	8,696	5,000	9	500	1.30	1.26	1.30	1.26	1.30	1.26	22	25				
Long Branch, N. J.	8,872	22,000	100	3,700	1.60				1.50		22	25				
Warren, O.	8,529	8,500	18	600	.80 to 1.10				.80 to 1.10		18	40				
Murphysboro, Ill.	8,403	8,000	3	150	1.50				1.25		22	10	4	* 24.00		
Watertown, Wis.	8,437	4,000	7	500	1.80	1.60	1.60	1.40	1.60	1.40	18	25	95	* || 1.75		
Peru, Ind.	8,403	8,500	6	311	1.50	1.50	1.50	1.50	1.50	1.50	18	.5				
Plattsburg, N. Y.	8,434	10,000	10	y 437	2.50	2.00 to 1.50			1.50	1.25	22—24	20		22.50	2,000	
Pekin, Ill.	8,420	12,000	16	550	1.00 to 1.50				1.00 to 1.25	18						
Kewanee, Ill.	8,382	10,000	9	484	1.50	1.40			1.50	1.40	22	30				
Bowling Green, Ky.	8,226	12,000	12	500	2.00	1.80	1.00		.95 to .75	17	40					
Emporia, Kan.	8,223	18,000	9	600	2.50	1.50	1.50				16	25				
Columbus, Ind.	8,130	9,000	7	500	1.25	1.25	1.25	1.00			16	15				
Warren, Pa.	8,043	9,000	1	96	1.10	1.00							24	* 26.28	†	
Laconia, N. H.	8,042	9,000	6	530	2.00	2.00	2.00									
Rahway, N. J.	7,935	9,000	13	700	1.75	1.50	1.75									
White Plains, N. Y.	7,899	7,500	19	1,150	1.80	1.70	1.50									
Beatrice, Neb.	7,875	12,000	7	320	2.00				1.55	2.00	1.25	24	25			
Gainesville, Tex.	7,874	8,000	4	326					2.35		2.00	18	15			
Madison, Ind.	7,835	8,000	8	595					1.50		1.00	19	25			
Jackson, Miss.	7,816	3,000	5	300	2.75				2.25		1.75	18	10	17.00	x	
Calais, Me.	7,655	7,800	5	318	4.00				3.00	2.00						
Martinsburg, W. Va.	7,504	7,000	4	200	2.00				1.60	1.60	1.50	16—18	40			
Salem, O.	7,582	8,000	12	650	1.50				1.25		18	33				
Grand Island, Neb.	7,554	10,000	9	475	2.50	2.00 to 1.50				1.50	26	30				
Tucson, Ariz.	7,531	3,000	1/4	100	4.00				2.00		18	20				
Red Wing, Minn.	7,525	8,000	7	425	2.00				1.50		22	22	12	* 18.00	1,800	
Nevada, Mo.	7,401	10,000	10	401	2.00				2.00	1.50	1.30	17—18	16			
Tonawanda, N. Y.	7,421	15,000	17	425	1.80	1.50 to 1.25			1.80	1.50 to 1.25	18	5	271	* 21.50	4,000	
Waukesha, Wis.	7,419	7,419	15	756	1.80	1.40 to 1.70			1.80	1.40 to 1.70	18	40				
Burlington, N. J.	7,392	10,000	12	900	1.50						1.50	23	40			
Nebraska City, Neb.	7,380	12,000	9	265	1.75	1.75	1.75				18	20	30	* 20.00	†	
Eureka, Cal.	7,327	8,000	3	175	3.00				2.50		20	10				
Bethlehem, Pa.	7,293	25,000	34	1,000	1.75	1.50	1.75				24	12				
Rome, Ga.	7,201	12,000	7	376	2.10	2.00	1.50				1.30					
Staunton, Va.	7,289	12,000	10	620	.75				.75		20	70				
Lock Haven, Pa.	7,210	7,500	2	300	2.00				1.75		1.50	22	10			
Conneaut, O.	7,133	9,000	10	200	1.35				1.25		1.10	1.00	17			
La Porte, Ind.	7,113	8,000	15	225	2.00	1.70	1.50				1.35	20	40			
Bristol, Pa.	7,104	7,300	10	650	1.60	1.52	1.60				1.52	18	60			
Norwalk, O.	7,074	10,000	22	860	1.00				.80		1.00	20	50			
Independence, Mo.	6,974	10,000	6	y 250	2.00	2.00	1.50				1.50	18	35	* 24.00	2,555	
Ottawa, Kan.	6,934	8,000	8	500	2.00				1.50		22	50				
Rochester, Minn.	6,843	7,000	6	250	2.00				1.50		28	25				
Centralia, Ill.	6,721	6,500	14	720	1.50	1.35			1.20		18	20				
Baker City, Ore.	6,663	7,000	5	200	3.00				2.50		20	20	50	* 48.00	Dark nights.	
Bellefontaine, O.	6,649	6,650	23	1,197		1.25			.50		22—24	61	32	Free.	Every night.	
Crawfordsville, Ind.	6,649	7,000	8	450	1.50	1.50	1.00		1.00		21.5	20				
Santa Barbara, Cal.	6,587	10,000	10	350	2.00	1.60 to 2.00			2.00	1.60 to 2.00	22	10	45	* 18.00	12 M.-Dawn.	
Benton Harbor, Mich.	6,562	15,000	17	y 800	1.60	1.40	1.60		1.40		24	33	75	* 20.00	2,221	
Florence, Ala.	6,478	9,500	5	320	2.25	2.00	2.00		1.50		18	15	60	* 24.50	2,100	
Charlotteville, Va.	6,449	10,000	4	300	1.25	1.00	1.25		1.25	1.00	16.5		150	To 11 P. M.		
Coshocton, O.	6,473	7,500	7	400	1.40	1.25	1.40		1.25	1.25	18	20				
Belleview, Ky.	6,332	5,000	10	400	1.25						20		106	25.00		
Salisbury, N. C.	6,277	6,000	2	160	3.00				2.50		20		65	12.00	x	
Montpelier, Vt.	6,266	9,000	4	225	2.50	1.50	2.50		1.50		20	5				
Albuquerque, N. M.	6,238	10,000	6	240	2.75	2.00	2.00		1.75		16	15				
Canandaigua, N. Y.	6,151	6,500	7	y 350	2.50	2.00 to 1.50			1.25	1.25	18	30	13	* 23.55	After 1 A. M.	
Norwalk, Conn.	6,125	12,716	20	1,000	2.00	1.80	1.50		1.50	1.35	18	30				
Paris, Ill.	6,105	7,000	8	400	2.00				1.50		22	25				
Troy, O.	5,881	7,000	5	300	1.50						16					
Conshohocken, Pa.	5,762	3,500	6	296					1.80		1.25	20	15			
Coatesville, Pa.	5,721	7,000	9		1.70				1.60		1.10	18	25			
Litchfield, Ill.	5,918	3,500	4	300	2.00				1.50		1.50	22	40			
Santa Cruz, Cal.	5,659	2,500	4	300	3.00				2.25		18	20				
Columbia, Mo.	5,051	6,000	3	165	3.00 to 1.50				1.50		18	40				

AMONG THE MUNICIPAL WORKERS

The People Who Make the Modern City Possible—Information of Importance to City Officials and Others

OIL TO LAY THE DUST

THE use of oil on streets and highways has demonstrated that there is no longer any necessity for the clouds of dust that a gust of wind or a passing vehicle raise in dry weather. For some time the municipalities of California have been experimenting with oil sprinkling in place of water and the results have not only proved the efficacy of the oil for the purpose, but also the greatly reduced cost of keeping down the dust. The plan pursued by Sacramento is typical of the others. The oil was applied hot and cold, but the former gave the best results. It was heated to a temperature of 180°, in a boiler adapted for the purpose, pumped into a sprinkler and then sprayed over the roads. The outfit cost about \$1,000. Not only was the oil cheaper in the long run, but it gave a hard, smooth surface and allowed increased loads with a decreased strain on the horses. The injury to rubber tires was found to be practically of no account.

The first application required about one-third more oil than the subsequent ones, but only two applications a year were necessary.

that there is a regulator to produce a fine spray of oil. The accompanying cut shows one of the Studebaker wagons made for sprinkling the oil.

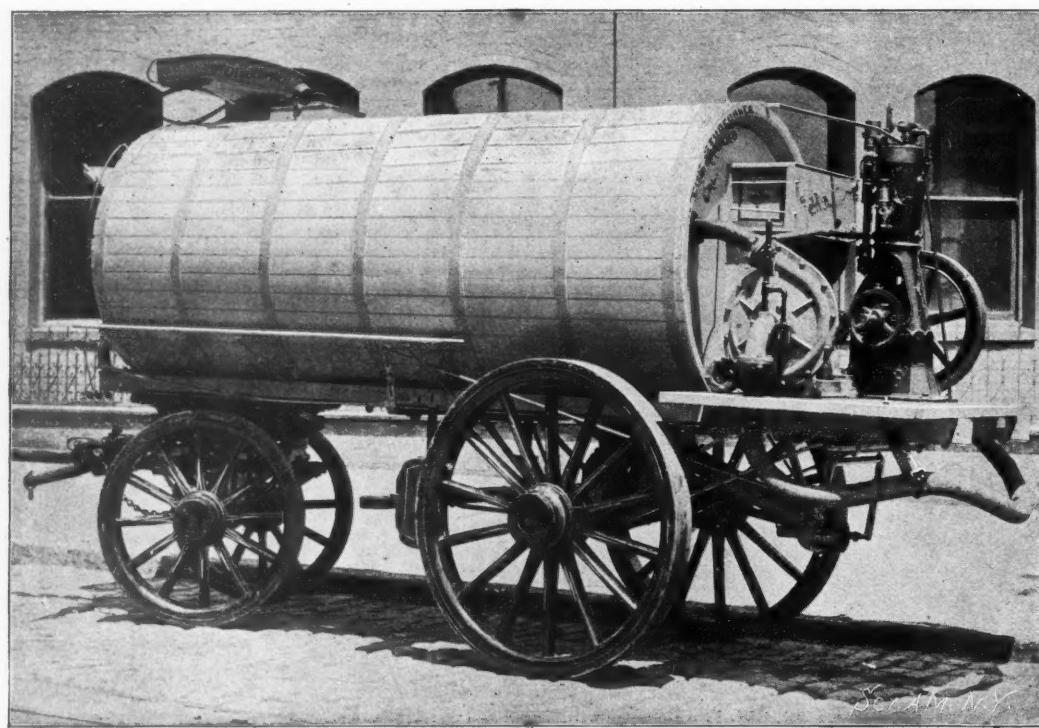
Columbia, S. C., has been experimenting with oil on its streets to lay the dust. In regard to these trials, Mayor F. S. Earle says: "We tried the oil on one block, about 500 feet in length, in which the roadway had been lately macadamized. As it was only an experiment, we did not go to the expense of getting a special machine to spread the oil. We used what is known as a whitewash machine, and with it the oil was pumped from barrels directly onto the street. As a dust layer it was a success, but some might object to the odor. The atmosphere did not seem to be as fresh and cool as on the streets that were watered by the sprinkling cart."

BITUMINOUS MACADAM IN BROCKTON

IN laying some new pavement the city of Brockton, Mass., has introduced into the city through its highway department one of the

latest, as well as one of the finest wearing surfaces that is manufactured. It is known as bituminous macadam. This is the first bit of smooth pavement that the city has laid, and, instead of contracting for the work, the Warren Brothers' Company, of Boston, which holds the patents for the surface material, brought its plant to Brockton to prepare the mixture. Mr. Walter B. Warren had personal supervision of the work. The plant is a very large one, is of iron and steel and contains all the machinery for heating the stone, separating it into different sizes, mixing it and performing all the other necessary operations.

This bituminous macadam pavement is composed of a bituminous preparation from which the lighter oils of tar are drawn off, leaving a hard and lasting material which is affected by neither the heat nor the cold and is impervious to water. In constructing the road the surface is taken off for six inches in depth and four inches of broken stone



OIL-SPRINKLING WAGON FOR USE ON HIGHWAYS—CAPACITY, 1,500 GALLONS; WIDTH OF SPREAD, 28 FEET *

In the city of Canton it was found that the expense of sprinkling was reduced 45 per cent. On roads twelve feet wide, 100 barrels of oil sufficed for the first application and sixty barrels for the second, six months later. In Los Angeles the use of oil is an established custom and the streets are in perfect condition as regards absence of dust. In Golden Gate Park, San Francisco, the main driveway of the park, four and one-half miles long, was sprinkled with the oil, much against the opposition of the citizens, but the results have more than justified the experiment. This road is subject to heavy travel and the clouds of dust that settled on the foliage marred one of the exceptional beauties of the park. Since the oil was used no dust flies, no clothes have been damaged as anticipated, and the surface of the road is compact and firm. The economy of oil over water was also demonstrated. On this driveway alone \$500 was saved a month in addition to the 70,000 gallons of water per day. Two applications a year was all that were required.

The sprinkler used is the same as that employed for water, except

is laid in the excavation and rolled hard by a steam roller. Over this is placed the bituminous mixture to a depth of two inches, is rolled while hot and, upon cooling, resembles an asphalt pavement. The surface is hard as stone, is more durable than asphalt and costs but half as much. The stone in the layer on top is of different sizes from one and one-half inches to a pulverized stone; thus every opening between the larger stones is filled. After the stone is dried and separated into sizes, a mixer churns all the various sizes together and the bituminous material is mixed with it when it is ready for laying. The coarse grain of the stone gives great rigidity to the pavement and enables it to stand great compression.

Although a new road material, the Warren Brothers' Company has laid it in many cities. For instance, Lowell has 5,000 yards, New Bedford 5,000, Pawtucket 3,000 and Taunton is soon to have 4,000 yards. Several cities in the West are using this pavement. Cleveland has just closed a contract with the company to lay three miles of this material in its suburbs.

* Courtesy of *The Scientific American*.

TRADE PUBLICATIONS

—The illumination of cities, towns and villages is continually growing in interest and importance. For this reason city officials in general will be pleased to receive the well illustrated catalogue recently issued by the Eagle Generator Company, of St. Louis, Mo., manufacturers of the Eagle Automatic Acetylene Generators and other apparatus.

—The Heine Safety Boiler Company, of St. Louis, Mo., has just issued an attractive 24-page pamphlet, well illustrated, which sets forth the merits of its celebrated water tube boilers, adapted to all pressures, duties and fuels. If this catalogue were in the hands of every one interested, the advantages of the Heine Safety Boiler would be readily seen.

—Superintendents of streets, city engineers and others who have to do with the care of streets, as well as those who are obliged to use wagons in the conduct of a city's business, will be interested in the profusely illustrated catalogue of 120 pages, issued by the Sebastian Wagon Company, of 217 East Forty-third street, New York

City. This company also manufactures a fine line of police patrol wagons, ambulances, fire department wagons, drays, etc.

—The Wheel Within Wheel Company, Park Row Building, New York City, has issued a beautifully illustrated catalogue which tells all about the new kind of wheel it makes. It is adaptable to every form of running vehicle, wagon, wagonette and truck, or the heaviest automobile. It has many advantages and it will be profitable for all who are interested in wheels to send for a copy of this catalogue.

—"Flexiduct" is the title of an attractive twelve-page pamphlet, with cover, issued by the Osburn Flexible Conduit Company, 31 Park Row, New York City. It tells of a new and perfectly flexible conduit which has been approved by the Board of Fire Underwriters and inspection boards throughout the country. The story will be found of practical interest to owners, architects, builders, electricians and all who have anything to do with electric wiring. A free copy will be sent on application.

TRADE NOTES

—If you want poles, ties and timber in any shape, size or form, address S. C. Strock, 11 Broadway, New York City.

—If you have anything to patent you will be well treated by H. B. Wilson & Co., patent lawyers, Washington, D. C.

—The "old and reliable" Erie is becoming more popular every day. It is one of the picturesque trunk lines of America.

—The New York Central Line is known the world over. Its name is a synonym for good service, rapid transit and comfort.

—Many cities at the present time are using large amounts of conduit wire manufactured by the Sprague Electric Company, New York City.

—It is interesting to the travelling public to know that the Lackawanna Railroad uses hard coal. This means no smoke, no dust. 'Nuf sed."

—"Okonite" is coming to be known as the standard for rubber insulation. It is made by the Okonite Company, Ltd., 253 Broadway, New York City.

—If you want to blast a rock or "blow anything up," write to the Nitro-Powder Company, Kingston, N. Y., for descriptive pamphlet and prices.

—Springfield, Mass., is putting its overhead wires under ground. The conduit used is made by the American Vitrified Conduit Company, 39 Cortlandt street, New York City.

—Trussed ladders are among the specialties manufactured by The Seagrave Company, Columbus, O. It makes other fire apparatus also. Its catalogue can be had for the asking.

The Contractors' Tool Company, of 118 South Sixth street, Philadelphia, Pa., supplies machinery and tools for pavers, cement workers and roofers. Ask for catalogue and prices.

—If your fire department has not yet purchased one of the Browder Life Saving Nets it is behind the times. You better send for a catalogue to T. F. Browder & Co., Greenfield, O.

—When you talk about fire hose you should consider the merits of the Eureka Fire Hose. It would be well for you to correspond with the Eureka Fire Hose Company, 13 Barclay street, New York City.

—The Lake Shore & Michigan Southern carries the mail with perfect satisfaction to the United States Government. A large number of the travelling public will never use any other road between Buffalo and Chicago.

—The Chicago Fire Hose Company, of 54 La Salle street, Chicago, Ill., makes a cotton rubber lined hose which is calculated to increase the efficiency of the American fire department on account of its perfection.

—There are others, but when you travel in certain portions of the Middle West you would better start on the "Knickerbocker Special"

or the "Southwestern Limited," two famous vestibuled trains of the "Big Four" Route.

—The Ericsson Telephone, made by the Ericsson Telephone Company, 296 Broadway, New York City, has been used for over twenty years with perfect success. When you use this telephone you are sure to be pleased.

—The C. H. & D. Railway is in the market for an auto car, or any device that will give an independent movement to the passenger car for suburban travel. Address D. G. Edwards, C. H. & D. Traction Co., Cincinnati, O.

—Almost everything in the way of fire apparatus can be purchased from the Fire Extinguisher Manufacturer Company, 325 South Desplaines street, Chicago, Ill. If you haven't a new catalogue you better get one.

—The Boulevard Globe & Lamp Co., 136 Liberty street, New York City, reports business in a flourishing condition. Recent large orders have been received from Geneva, N. Y., Baltimore, Md., South Amboy, N. J., and other places.

—At a recent New York fire over three thousand feet of valuable hose were destroyed. This is one of the ways in which the demand for Fabric Fire Hose is increased. This well known company is located at 168 Murray street, New York City.

—It is interesting to know that 148 cities in the United States have adopted the mechanical filter which is manufactured by the New York Continental Jewell Filtration Company, 15 Broad street, New York City. This fact alone means that thousands of lives will be saved annually.

—In a letter recently addressed to the President, Mr. W. L. Dickel, the Union Gas & Electric Company, says: "We are using your Standard lantern top with the Pilot lighter at almost every one of our companies, and all of them where they are using gas for street illumination. We find they are very satisfactory."

—The veteran member of the firm of Studebaker Brothers, the Hon. Clem Studebaker, recently died at his home at South Bend, Ind. Mr. Studebaker was born in 1831, and has lived a long and useful life. The success of the firm has been largely due to his energy and skill as a business man. But success did not come to him without a struggle, for his early career was filled with many difficulties which demanded privation and self-sacrifice on his part. He was a broad minded, generous spirited and benevolent hearted citizen, and several substantial buildings adorn the city of South Bend as substantial evidence of his philanthropy. He was highly esteemed by his fellow citizens as well as by those with whom he came in contact in a business way. The South Bend *Times* of November 27th issued a memorial supplement which chronicled the events of his long and useful life.

ACETYLENE GAS AT THE PAN-AMERICAN

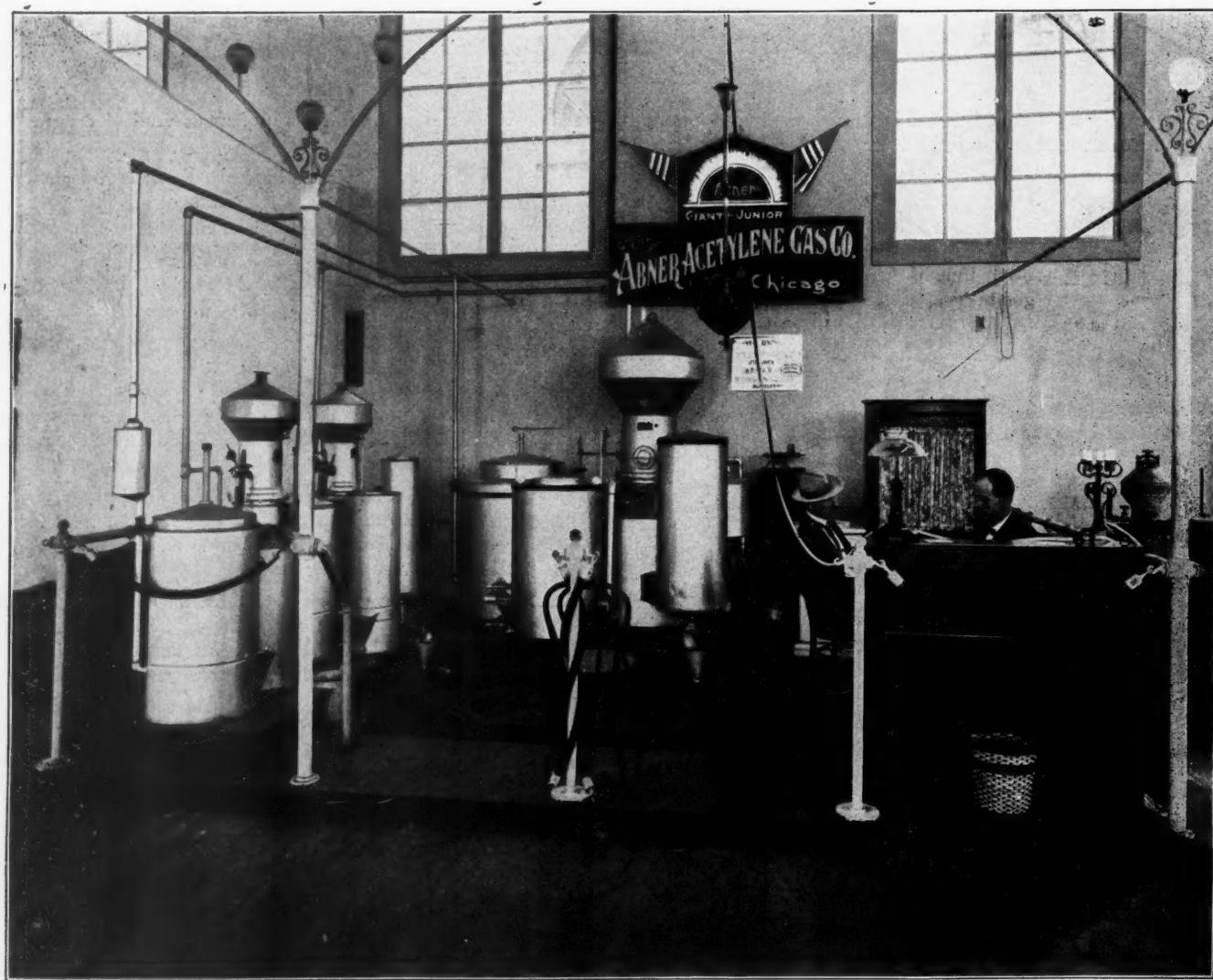
Rapid Growth of Acetylene Gas Industry—Comparatively Unknown at Chicago at World's Fair—Millions in It—Exhibit of the Abner Company

THE growth of the acetylene gas industry during the last half decade has been truly marvellous. At the World's Fair in 1893 there was no formal exhibit of acetylene gas. Its discovery and development have come since that date. The rapidity with which it has won the public favor is well shown by the fact that at the recent Pan-American Exposition it had a building assigned to itself, which was one of the most beautiful on the grounds.

Among the prominent exhibitors was the Abner Acetylene Gas Co., Northern Office Building, Chicago, Ill. This exhibit was in charge of the Company's general sales agent and three assistants.

tures a perfect, simple and safe acetylene gas system for large lighting and municipal systems. The great number of acetylene lighting plants now in operation in the United States and foreign countries which are using Abner Giant systems, speak well for the product of this Company.

The accompanying illustration clearly sets forth the exhibit of the Abner Company. Its attractiveness is quite evident and the large number of orders which have been placed with this Company during and since the close of the Exposition is a gratifying evidence of superiority. The Company is in position to name prices on acetylene



THE EXHIBIT OF THE ABNER ACETYLENE GAS COMPANY AT THE PAN-AMERICAN.

It consisted of three acetylene gas generators, one thirty-light Abner Junior, one fifty-light Abner Giant and one 350-light Abner Giant, all full capacity, installed and in actual operation, to show the perfect and simple automatic workings of the measured carbide feed and self-cleaning system.

There was a novelty about the characteristics of this particular light which attracted great attention. The certain action of these acetylene generators in operation demonstrated the rising and lowering of the gas bells with each operation of the measured feeding device, was well calculated to attract and impress the most skeptical, leaving no doubt as to the claims of this company, which manufac-

lighting plants, ranging from ten lights to as many thousand, including town and city lighting. The lighting of halls, churches, court houses, residences and the like is one of its special fields.

Any one who is interested, or who desires information on acetylene lighting for municipal or individual plants, will find it to his advantage to apply to this Company and obtain its estimates.

Acetvlene, with its beautiful, white, health-preserving light, has obtained perfection as manufactured by the above system and can be installed at a very reasonable cost.

It gives greater candle power and is nearer to the sun's rays than any other artificial illuminant.

VOL. XI., NO. 6

TUESDAY, DECEMBER 1, 1886.

MUNICIPAL JOURNAL

AND ENGINEER.

PROGRESS

AN
INTERNATIONAL
MAGAZINE
DEVOTED TO
MUNICIPAL AFFAIRS
AND
ALLIED INTERESTS

SINGLE COPIES 25 CENTS. SUBSCRIPTION THREE DOLLARS PER ANNUM.

PUBLISHERS, MUNICIPAL JOURNAL AND ENGINEER,
255 BROADWAY, NEW YORK.

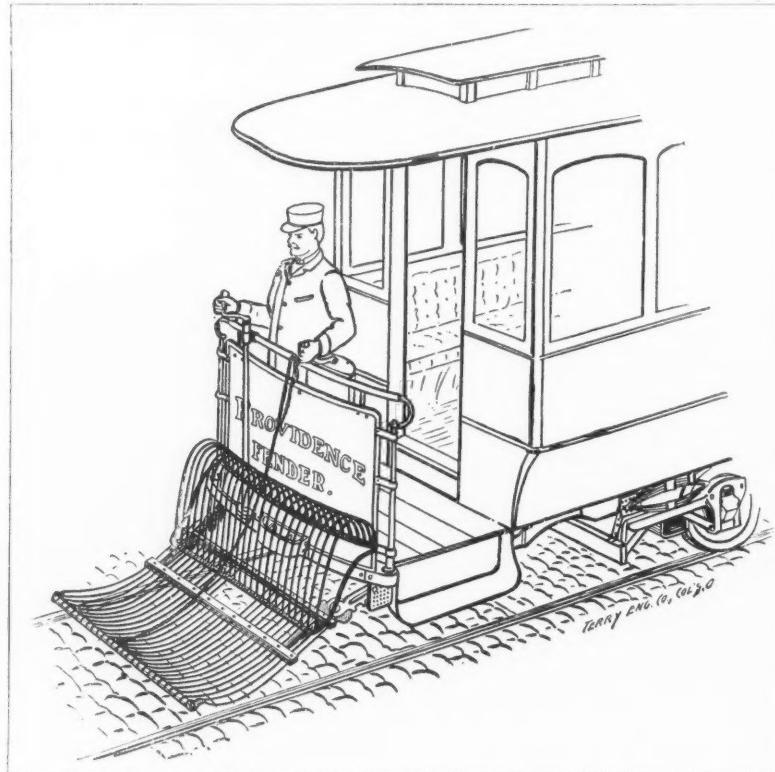
Table of Contents on page 4

PROVIDENCE CAR FENDERS SAVE HUMAN LIVES.

Ninety-five per cent. of all car fenders used in the world, other than those made by electric roads themselves, are Providence Fenders.

PROVIDENCE FENDERS

are in practical operation on more than 9,000 cars operated on 129 electric roads in 250 cities and towns in the United States, South America and Europe.



There is no expense spared, either in material or labor, to make the PROVIDENCE FENDER the BEST LIFE SAVING DEVICE ever attached to an electric or cable car. In fact, it is the only car fender made that, when properly used, saves 100 per cent. of all lives placed in jeopardy.

MANUFACTURED BY

THE CONSOLIDATED CAR FENDER CO.

39 CORTLANDT ST., NEW YORK.

FACTORY, PROVIDENCE, R. I.

GENERAL ELECTRIC COMPANY,

SCHENECTADY, N. Y.

Complete Electrical Equipments

FOR

Railway, Power, Lighting,

NEW YORK OFFICE,
44 Broad Street.

SALES OFFICES,
in all Large Cities.

WENDELL & MacDUFFIE, 26 CORTLANDT STREET
NEW YORK, U. S. A.

CORPORATION PURCHASING AGENTS—STEAM and ELECTRIC RAILWAY SUPPLIES.

Falk Cast Welded Joints, Gears and Pinions—Taunton Snow Plows, Sweepers, Sprinkling Cars and Transfer Tables—Rochester Car Wheels—Jerome Metallic Packing—Bosley Weather Strips—Open Hearth Steel Castings.
CORRESPONDENTS FOR EXPORT TRADE.

CHRISTENSEN AIR BRAKES

absolute control of his car. Accidents are thereby avoided.

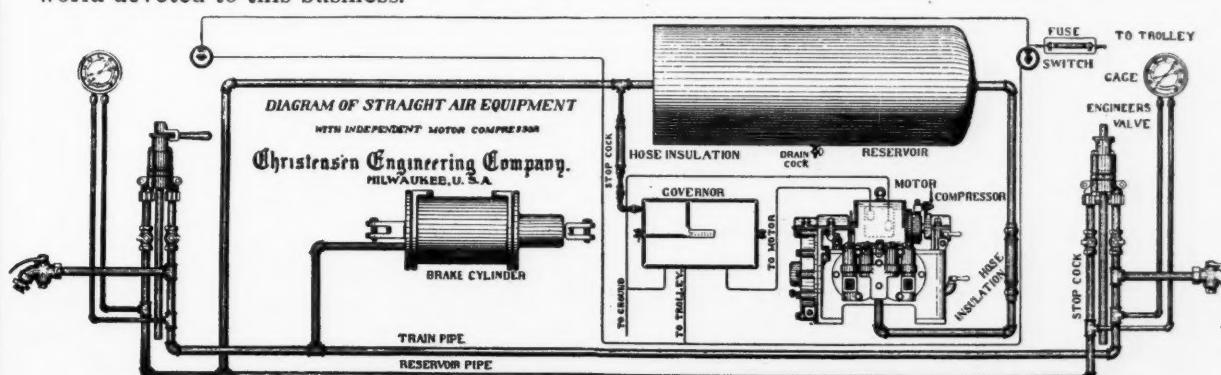
Christensen Air Brakes are made in various sizes and types for every service ranging from a small car to an elevated train. Adopted by many of the best electric railways in America and Europe. Largest plant in the world devoted to this business.

are not required on HORSE CARS, but no other brake is suitable for, or will properly control,

ELECTRIC CARS

with their increased size, weight and speed.

They enable the motorman to have quick and



Many times
more
Christensen Air
Brakes in
use than all
others
combined.

Christensen Engineering Company,

Manufacturers of Air Brakes.

MILWAUKEE, U. S. A.

F. C. RANDALL, Manager Eastern Department, 135 Broadway, New York.

VOLUME XI

OF THE

**Municipal Journal and
Engineer**

July to December, 1901, inclusive. Bound in Half Morocco,

PRICE, \$2.50**NOW READY****VOLUMES X, XI**

January to December, inclusive. Bound in Half Morocco, one book,

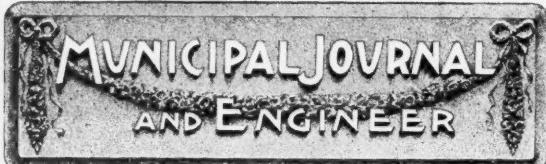
PRICE, \$4.00

Supply is limited and orders should be placed at once.

MUNICIPAL JOURNAL AND ENGINEER

253 Broadway, New York

SANITATION
GARBAGE PROBLEMS
SEWERS AND
SEWAGE DISPOSAL
PUBLIC HEALTH
FIRE AND POLICE
CURRENT TOPICS
FINANCE



PARKS, PAVING
GOOD ROADS
STREET CLEANING
WATER WORKS
PUBLIC LIGHTING
TRANSPORTATION
PUBLIC BUILDINGS
BRIDGES

VOL. XI

DECEMBER, 1901

No. 6

TABLE OF CONTENTS**CONTRIBUTED ARTICLES**

Planning and Equipping Municipal Record Rooms	249
M. S. Kelly.	
How to Improve Municipal Governments	251
Thomas G. Hayes.	
Wooden Pavements at Home and Abroad	254
Frederic Arnold Kummer, Jun. M. Am. Soc. C. E.	
The Truth About the Toledo Natural Gas Plant	257
Samuel M. Jones.	
A Modern Municipal Conduit	258
Charles E. Phelps, C. E.	
Fire-Proofing Methods for Buildings—Part IV	262
J. W. Howard, B. L., C. E.	
Acetylene Gas Widely Used as an Illuminant	264
Henry C. Earle, M. E.	
Among the Improvement Clubs	265
Charles Mulford Robinson.	
The Value of Oiled Roads	267
W. C. Ambrose.	
The Work of the Good Roads Train	270
Our Special Correspondent.	
Lowell and Its Solution of the Paving Problem	288
Walter J. Somers, C. E.	
Free Street Car Transportation	282
Tom L. Johnson.	
Dublin's New Central Station and Fire Escape	289
Our Special Correspondent.	
Firemen's Accident Insurance	291
Walter E. Price.	

GENERAL ARTICLES

Changes Needed in the Croton Dam	272
Some of the Newly Elected Mayors	281
A Thrifty New England City	287
Nottingham Railroads	288
Municipal Tramways at Dover	288
Working of Sand Filtration at Albany	288
International Public Health Work Proposed	292
Fire Exhibition at Berlin	293
Experiments with Formaldehyde as an Insecticide	293

EDITORIAL

Editorial Comment	274
Asphalt Plant Out of Business	275
Mechanical Voting in Recent Elections	276
Millions in Street and Road Improvements	276
Millions for Improvements in St. Louis	280

LETTERS TO THE EDITOR

A Growing Southern City	278
Best Pavements for Grades	278
Water and Light for Small Towns	279
Another City Clerk's Method of Indexing	279
Fire Department Salaries	280

**CURRENT NEWS AND PRACTICE
AMONG THE CITIES**

Public Telephones	284
Telephone Statistics	

ODD THINGS RELATING TO MUNICIPALITIES

Automatic Lamp Lighting	283
Public Clocks for Streets	
Municipal "Russian Bath."	
Aldermen Object to Beer	
One Drink Did It	
Baths in Public Schools	
Municipal Restaurants	
No Long Skirts	
A Unique Michigan Town	

CURRENT LITERATURE ON MUNICIPAL TOPICS

MUNICIPAL REPORTS	296
-------------------	-----

GAS STATISTICS IN AMERICAN CITIES

COMPARATIVE BIDS FOR CONSTRUCTION WORK	298
--	-----

PERSONALITIES

FIRE, WATER AND POLICE ITEMS	296
290, 291, 292	

RECENT INVENTIONS**MUNICIPAL BOND SALES FOR NOVEMBER**

297	
-----	--

AMONG THE MUNICIPAL WORKERS

Oil to Lay the Dust	300
Bituminous Macadam in Brockton	300
Trade Publications	301
Trade Notes	301
Acetylene Gas at the Pan-American	302

**SPECIAL RATES FOR CLUBS
FURNISHED ON APPLICATION**

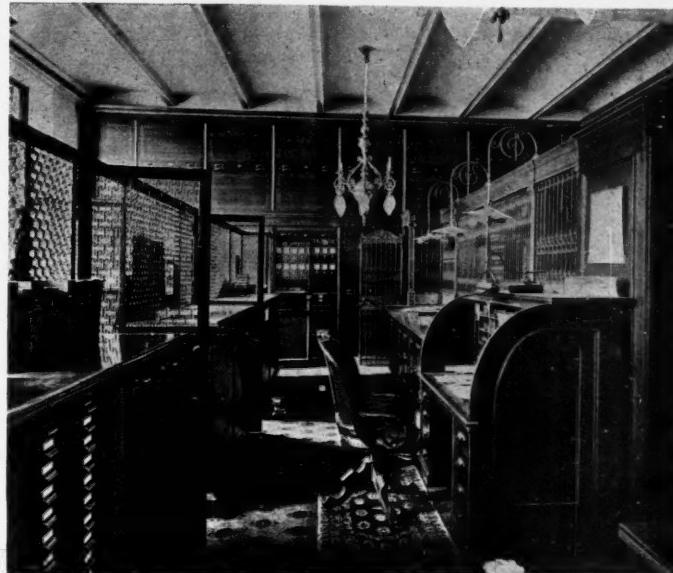
**AN OUTLINE
OF THE GOOD POINTS**

MECHANICAL ACCURACY.
COMPLETE KEYBOARD.
EASE OF OPERATION.
PERMANENT ALIGNMENT.
REMOVABLE PLATENS.
AUTOMATIC TYPE CLEANING.
SIMPLICITY AND DURABILITY.
A DOLLAR OF SERVICE FOR
EVERY ONE OF COST.

**OF THE
SMITH PREMIER
TYPEWRITER.**

ILLUSTRATED CATALOGUE FREE.

THE SMITH PREMIER TYPEWRITER CO.
SYRACUSE, N.Y. U.S.A.



Metallic Cabinet Work—Philadelphia City Hall

Over Half a Million Dollars Worth of Metallic Fixtures and Filing Devices in the above Building.

INCOMBUSTIBLE. ARTISTIC. DURABLE.

MANUFACTURED BY

ART METAL CONSTRUCTION CO.,
JAMESTOWN, N. Y.



The Ogden

Automatically Regulated Liquid
Door Check and Spring. ♦ ♦ ♦

Easily applied, positively regulated, the simplest
and strongest check made. All main workings
are of Steel Drop Forged and Case Hardened.

10,000 IN USE GIVING UNIVERSAL SATISFACTION.

Full Descriptive Catalogue Apply to

The Ogden Mfg. Co., Newark, N. J.

In use in the White House, Washington, D. C., also throughout
Ellis Island Emigrant Station, New York City School Houses,
and many other prominent Public and Office Buildings. :::::

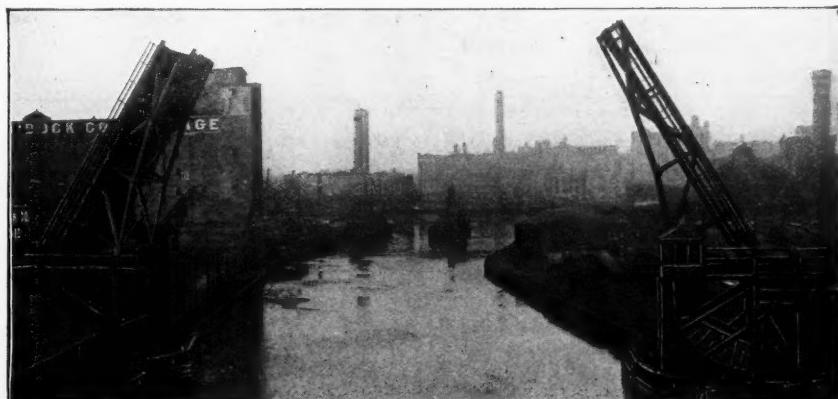
Electric Fountains

ARE ALWAYS POPULAR.

We Build Every Description
WITH and WITHOUT ELECTRICITY.

Darlington Electric Fountain & Supply Co.,

REAL ESTATE BUILDING, PHILADELPHIA, U. S. A.



Taylor Street Scherzer Rolling Lift Bridge, Chicago—Open.
Invented by WM. SCHERZER, C. E., Patented.

Twenty-seven other large Scherzer Rolling Lift Bridges in successful use and under construction at the present time.

The Scherzer Rolling Lift Bridge forms an artistic and pleasing structure and fulfills every modern requirement of a movable bridge.

Preliminary Sketches and Estimates furnished to responsible parties upon request, accompanied by the necessary data.

“The”

Scherzer Rolling Lift Bridge Co.,
1616 Monadnock Block, Chicago.

"A finger touch finds the reference"

IN THE

"Y & E" Card Index

Adapted for use in any connection in any business. If you want to know how it can be applied to your special requirements, send for our new Catalogue No. 27. It illustrates and explains 35 different forms of records and gives complete information on the subject of Card Indexing.

YAWMAN & ERBE MFG. CO.
Factories and Main Offices:
ROCHESTER, N. Y.

Principal Branches:
NEW YORK, 360 B'way. CHICAGO, 138 Wabash Av.
SAN FRANCISCO, 29 New Montgomery St.

ERICSSON

TELEPHONE

The only perfect Telephone
No experiment.
Sold for over 20 years.
When you use this Telephone you are sure to be pleased.
Try it and be convinced.
Send for catalogue.

ERICSSON
TELEPHONE
COMPANY,
296 Broadway,
New York City.

Index to Advertisers.			
For Buyer's Directory, See Page 37.			
Abner Acetylene Gas Co.....	9	Imperial Gas Lamp Co.....	8
Acme Water Storage & Cons. Co.....	10	Ingersoll-Sergeant Drill Co.....	21
Alexander, Braeley & Dunning.....	26	Int. Sewage Disposal Co.....	30
American Fire Engine Co.....	33	Int. Water Filtration Co.....	10
American Municipal Supply Co.....	27	Iowa Engineering Co.....	29
American Vitrified Conduit Co.....	22	Keasbey, Robert A.....	31
Art Metal Construction Co.....	5	Kelly, O. S., Co.....	26
Atlantic Gulf & Pacific Co.....	21	Kuichling, Emil.....	29
Atwater, Henry W.....	30	Lake Shore & Mich. So. Ry. Co.....	36
Bacon Air Lift Co.....	10	La France Fire Engine Co.....	33
Big Four Route.....	36	Maslins	37
Blake, M. J. & M.....	30	McMurray, Eugene A.....	29
Boulevard Globe & Lamp Co.....	8	Meacham & Wright	25
Browder & Co., T. F.....	35	Miller & Co., J. P.,	29
Buffalo Meter Co.....	10	Mineralized Rubber Co.....	37
Builders' Iron Foundry.....	10	Moore, E. F.....	29
Burgard, Henry P.....	29	Morse, W. F.....	30
Chicago Fire Hose Co.....	35	New York Cen. & Hud. River R. R.....	36
Christensen Engineering Co.....	3	N. Y. Continental Jewell Filtration Co.....	40
Christian, G. L.....	29	New York & Bermudez Co.....	23
Cincinnati, Hamilton & Dayton Ry.....	36	North American Paving Co.....	23
City Wastes Disposal Co.....	29	Ogden Mfg. Co.....	5
Conard, W. R.....	29	Okonite Co., Ltd.....	40
Consolidated Car Fender Co.....	2	Orvis Down Draft Boiler & Furnace Co... Pacific Flush Tank Co.....	31
Consolidated Rubber Tire Co.....	39	Pennsylvania Globe Gas Light Co.....	7
Contractor's Tool Co.....	37	Pioneer Iron Works	26
Craft, Jesse	21	Pittsburg & Buffalo Co.....	22
Croes, J. J. R.....	29	Pittsburg Meter Co.....	10
Darlington Electric Fountain & Supply Co.	5	Port Huron Engine & Thresher Co.....	25
Darrach, Chas. G.....	29	Pulsometer Steam Pump Co.....	21
Delaware, Lackawanna & Western R. R.	36	Rand Drill Co.....	21
Diggs, D. W.....	34	Rex Fire Extinguisher Co.....	34
Ericsson Telephone Co.....	6	Rider, Joseph B.....	29
Erie R. R.	36	Ruggles Coles Engineering Co.....	25
Eureka Fire Hose Co.....	35	Scherzer Rolling Lift Bridge Co.....	5
Fabric Fire Hose Co.....	40	Scholl, Julian, & Co.....	26
Fanning, J. T.....	29	Seagrave Co., The.....	34
Fire Extinguisher Mfg. Co.....	35	Shadolt Mfg. Co.....	31
Fisher & Saxton Co.....	27	Smith Premier Typewriter Co.....	5
Gamewell Fire Alarm Telegraph Co.....	33	Standard Water Meter Co.....	10
General Electric Co.....	3	Strock, S. C.....	37
Gest, G. M.....	29	Studebaker Bros. Mfg. Co.....	6
Globe Asphalt Co.....	23	Sugar, S. S.....	31
Grant Axle & Wheel Co.....	39	Texas & Pacific Coal Co.....	22
Greger Mfg. Co.....	27	Tingley Co., R. H.	29
Gregory, Elisha.....	29	U. S. Sanitary Co.....	30
Haggerty Refining Co.....	30	U. S. Wood Preserving Co.....	28
Hague, Chas. A.....	29	United States Street Cleaning Co.....	38
Hainsworth, John J.....	29	Walker, H. B.....	37
Hering, Rudolph & Geo. W. Fuller.....	29	Walker, Robt. L.....	30
Holland & Co.....	29	Warren Brothers Co.....	24
Hooke, Robt.....	25	Welsbach Street Lighting Co.....	7
Howard, J. W.....	29	Wendell & MacDuffie.....	3
		Willson & Co., H. B.....	37
		Wise & Watson.....	29
		Yawman & Erbe Mfg. Co.....	6

The Studebaker Celebrated Improved Patent Street Sprinklers

for sprinkling city streets, village, county and state highways, race tracks, speedways and boulevards. Also made in sizes suitable for sprinkling private grounds and golf links. Volume of water under complete control of driver, and fitted with latest device for controlling width of spread. Valves cannot clog up with dirt. Absolutely simple in construction. Send for catalogue.

STUDEBAKER BROS. MFG. CO., Broadway and Prince St.,
NEW YORK CITY.

NEW YORK, 33 Nassau Street.

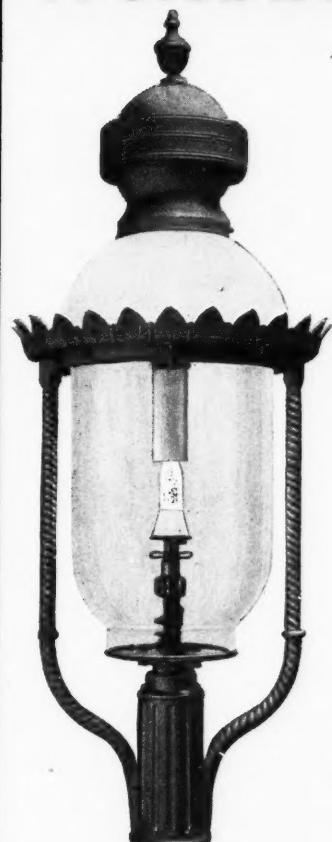
PHILADELPHIA, Broad and Arch Streets.
CLEVELAND, 809 Cuyahoga Building.CHICAGO, Foot of Orleans Street.
ST. LOUIS, 712 Roe Building.BOSTON, 624 Tremont Building.
SAN FRANCISCO, 712 Polk Street.

Welsbach Street Lighting Company

OF AMERICA

Controls
and Operates the

Welsbach System of Street Lighting,



No. 36.

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

Points
of
Merit

**Economical,
Attractive,
Successful,
Up-to-date.**

IT LIGHTS THE STREET.



No. 38.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.

THE NEW YORK AND NEW JERSEY GLOBE GAS LIGHT CO., LTD.,
31 NASSAU STREET, NEW YORK

GLOBE LIGHT AND HEAT COMPANY,
52 LAKE STREET, CHICAGO.

Pennsylvania Globe Gas Light Company

BROAD AND ARCH STREETS,
PHILADELPHIA

*Contractors for Street
Lighting*

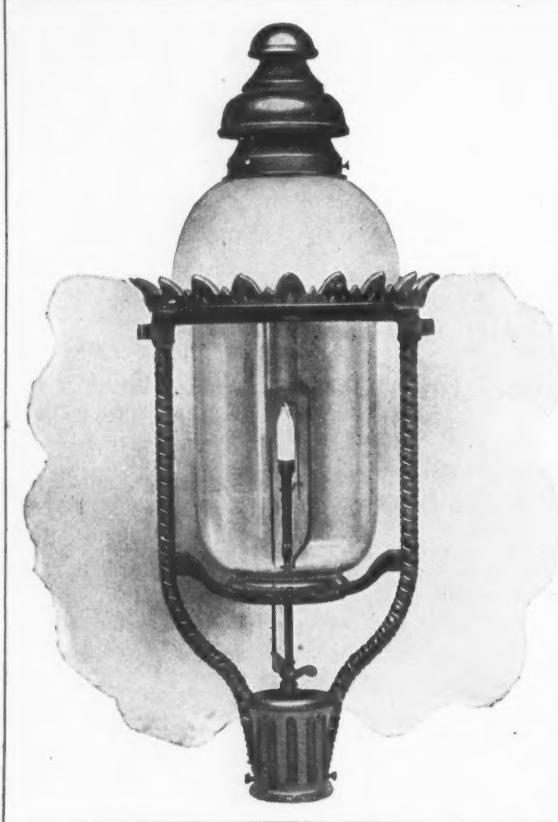
Manufacturers of .

Street Lanterns and Posts, Gas Lighters' Torches
AND THE
Improved Royal Gas Machine and Mixer.

CORRESPONDENCE SOLICITED.

No. 20—With Socket and Attachment.

INDEX TO ADVERTISERS ON PAGE 6.



WE SELL OUTRIGHT AN INCANDESCENT

STREET LAMP

with the outside Pilot light at *half the cost* you pay others for rental. They're lighted from the outside, thus saving Mantles from breakage.

Is the Simplest, Most Durable and Economical Street Lamp in the World

Endorsed by Gas Companies and City Superintendents throughout the land.

"A nod is as good as a wink to a blind horse," therefore write us for catalogue and we will send you full particulars.

• • •

Boulevard Globe & Lamp Co.

W. L. DICKEI, President.

*136 Liberty St., Electrical Exchange Bldg.,
New York City.*

The Imperial Lighting System.

• • •

Simple in Construction.

Gives Brilliant and Diffusive Light . . .

Lowest Cost of Operation.

Equal to Electric Light at a Fraction of the Expense . . .

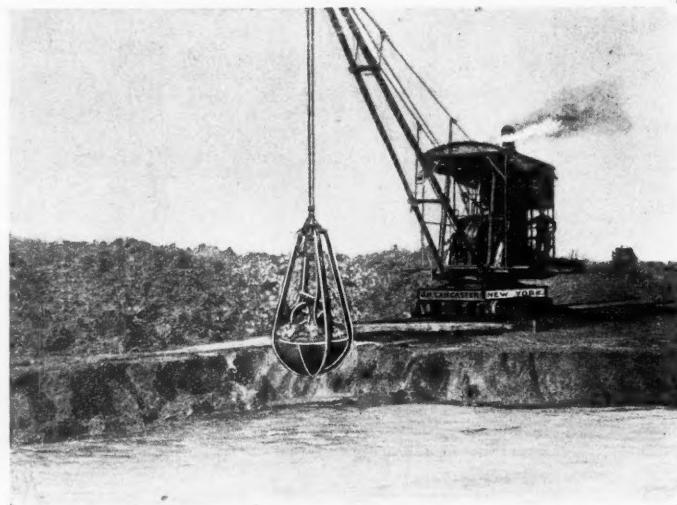
Investigation Solicited.



THE Imperial Gas Lamp Co.

132-134 LAKE ST., CHICAGO, ILL.

THE LANCASTER
FULL CIRCLE HOISTER WITH GRAPPLE



Operates Grapple, Clam Shell Bucket, Shovel, or Steam Traveling Crane.
Can be changed in thirty minutes to an efficient 30-foot Steam Pile Driver.

These Grapples, Buckets and Dredges dig solid earth, gravel, clay, mud and placer dirt, etc., with the greatest ease and rapidity. Hundreds in successful operation by the U. S. Government, contractors, bridge builders throughout the country, Central and South America and Canada.

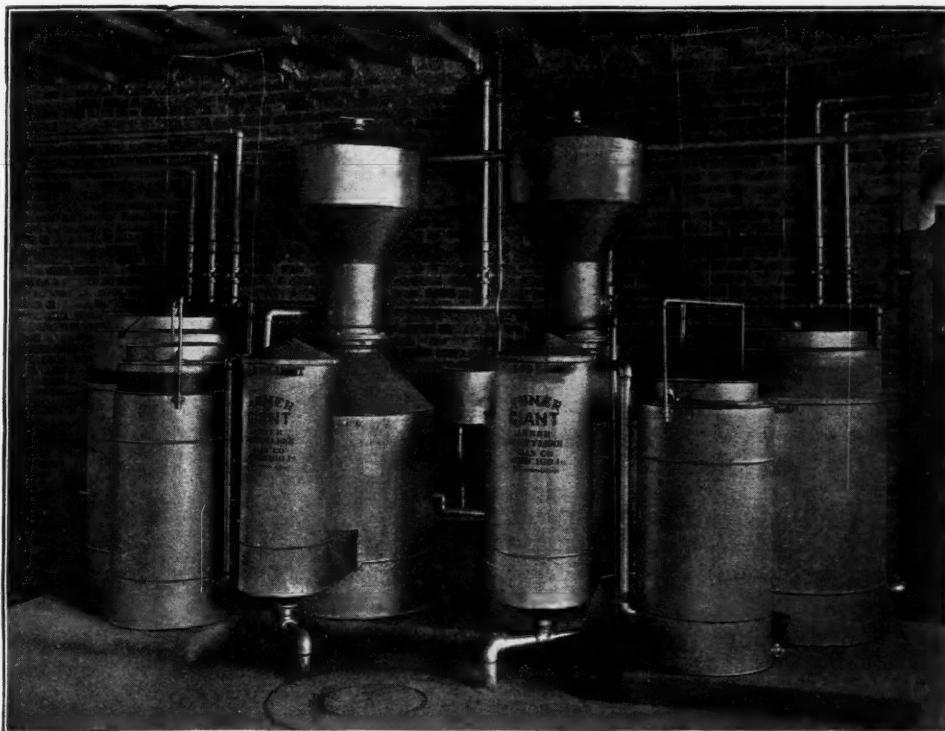
For full particulars write,

**JAMES H. LANCASTER,
123 LIBERTY STREET,
NEW YORK.**
See illustrated article in December issue of "M. J. & E."

ACETYLENE GAS FOR TOWN LIGHTING

ABNER GIANT GENERATOR PRODUCES THE IDEAL LIGHT

FOR
VILLAGES
TOWNS
CITIES
RESIDENCES
STORES
PUBLIC
BUILDINGS
ETC.



THE
ABNER IS
ABSOLUTELY
SAFE
SIMPLE
RELIABLE
DURABLE
AND OF
UNLIMITED
CAPACITY

ABNER GIANT GENERATOR.
1,000 LIGHT PLANT (TWO 500 LIGHT TANDEM) LIGHTING SIX BUILDINGS—SCHOOL SISTERS OF
NOTRE DAME, CHICAGO, ILL.

Requires no dismantling of parts or attention except to charge with Carbide. Otherwise it is entirely Automatic.

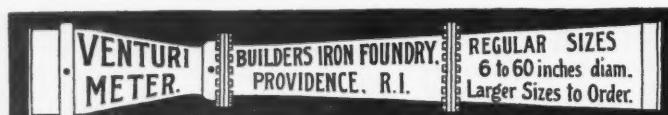
The Generator is self-cleansing and produces every atom of gas contained in the Carbide.

ESTIMATES FURNISHED FOR ANY SIZED PLANTS
OUR CATALOGUE IS FOR YOU

THE ABNER ACETYLENE GAS CO.
Northern Office Building, CHICAGO, ILLINOIS



BUFFALO METER CO.,
265 Washington Street, BUFFALO, N. Y.
Over 40,000 in Use.



THE VENTURI METER
is the only Practical Meter for measuring large quantities of water.
Its Accuracy is unquestioned and it is frequently employed to test the accuracy of pumps.
No By Pass is necessary, and the cost of ties, elbows and gate valves is avoided.

Standard Disk Meters



Standard Current Meters
Manufactured by the
STANDARD WATER METER CO.,
22-26 Reade Street,
NEW YORK.

Pittsburg' Meter Co.

East Pittsburg, Pa.

Awarded the

GOLD MEDAL

(The Highest Possible Award) at the
Pan-American Exposition

Keystone Water Meters
Pittsburg Water Meters
Westinghouse Gas Meters

Bacon Air Lift Company

100 BROADWAY, NEW YORK

MANUFACTURERS OF THE

Bacon Patent Simple and Compound
Air Lift Systems

HYDRAULIC ENGINEERING AND CONTRACTING

Water Works and Artesian Well Systems
Designed and Installed

The Acme Water Storage System.

PATENTED MARCH 9, 1897.

Provides a means of water storage for general use and fire extinguishment. Greater safety, higher efficiency and better sanitary conditions will be obtained by the use of this system. Water stored in air-tight tanks, placed in basement, sub-cellars, or at any convenient point in buildings or upon premises and delivered at any point in building or upon premises under any pressure desired. Information, plans and estimates furnished on application

Acme Water Storage and Construction Co.,
13-21 Park Row, NEW YORK.

A NEW METHOD, APPLICABLE TO CITIES, TOWNS, PUBLIC AND PRIVATE INSTITUTIONS.

MAXIMUM OF EFFICIENCY AND MINIMUM OF EXPENSE GUARANTEED.

CORRESPONDENCE SOLICITED.

International Water Filtration Company.

The newest and most efficient method of purifying domestic waters. Slow sand filters the standard of Europe and tested by years of use. We double their capacity on our filter beds by intermittent action and special construction. Bacteria spread through the bed instead of only a film on the surface. Not affected by weather conditions. Absolutely removes all disease germs. Principles of this system are SEDIMENTATION, BACTERIAL ACTION and FILTRATION, by NATURE'S METHOD, all under cover.

International Water Filtration Company,
Room 1026, Tremont Building, BOSTON, MASS.

The PULSOMETER Steam Pump

"THE CONTRACTOR'S FRIEND."

Often Imitated—Never Equalled. Over 20,000 in Use.

RECENT IMPORTANT IMPROVEMENTS.



The Handiest, Simplest, and Most Efficient Steam Pump for General Mining, Quarrying, Irrigating, Drainage, Tank-filling, Sewer, Bridge and General Contractors' Purposes, etc., etc. Muddy or gritty liquids handled without injury to the Pump.

Pulsometer Steam Pump Co.,

135 GREENWICH STREET, NEW YORK.

HENION AND HUBBELL, Selling Agents, 61-69 N. Jefferson St., CHICAGO.
Write for descriptive catalogue.

Correspondence solicited.

MILLER Automatic Siphon

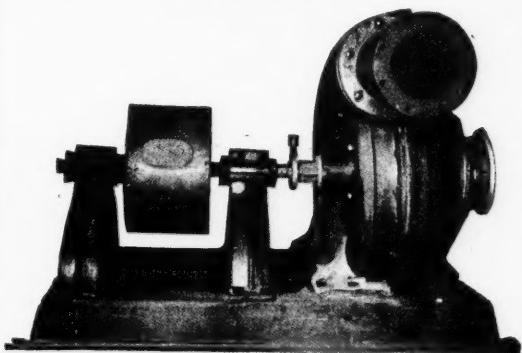
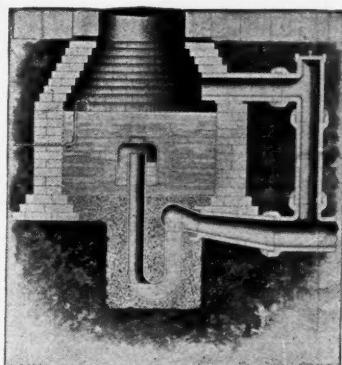
FOR
Intermittent Flush Tanks.

For Flushing Street Sewers and for Sub-Soil Irrigation.

No Moving Parts. No Valves. No Small Tubes to Clog or Choke. Nothing Whatever to Get Out of Order.

Pacific Flush Tank Co.,

84 La Salle St., CHICAGO.



CENTRIFUGAL PUMPS.

Bush's Patent for CONTRACTORS' USE.

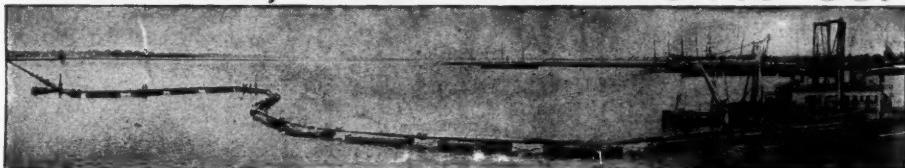
DREDGING,
DRAINAGE,
SEWERAGE,

RECLAMATION OF LAND,
IRRIGATION,
WRECKING.

PUMPING SAND and other LARGE MATERIALS for Cofferdams, Excavations, Foundations, etc.

JESSE CRAFT, SOLE MANUFACTURER,
260 FRONT STREET,
Corner of Dover St. **NEW YORK.**

ATLANTIC, GULF AND PACIFIC CO.



Hydraulic Dredge discharging through 5,700 ft. of pipe.

ENGINEERS AND CONTRACTORS:

Geo. W. CATT, M. Am. Soc. C. E., M. Inst. C. E., Pres. & Eng. THOS. J. LONG, M. Am. Soc. C. E., Vice Pres. & Engr.
H. S. WOOD, C. E., Sec. & Treas. H. KRUSI, C. E., Pac. Coast Man. R. A. PERRY, Supt.

SPECIALTIES: Dredging, Dredging Machines, Land Reclamation, Docks, Piers, Foundations, Bridges.

Correspondence solicited.

MAIN OFFICE: PARK ROW BUILDING, NEW YORK.
BRANCH OFFICES: 220 MARKET STREET, SAN FRANCISCO, CAL.
PIOVEER BUILDING, SEATTLE, WASH. MANILA, PHILIPPINE ISLANDS.

IMPERIAL TYPE 10

Duplex-Compound Air Compressors
Self Contained and Self-Oiling.

You ought to know about this Unique Compressor. We should like to give you a little inside information

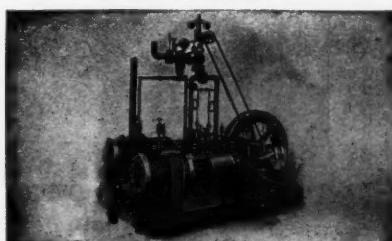
WE MAKE ROCK DRILLS ALSO.

RAND DRILL CO.,
128 Broadway, - - - NEW YORK.

THE INGERSOLL-SERGEANT DRILL COMPANY.

26 CORTLANDT ST., NEW YORK.

AIR
Compressors,
Air Lift Pumps,
Coal Cutters,
Rock Drills.



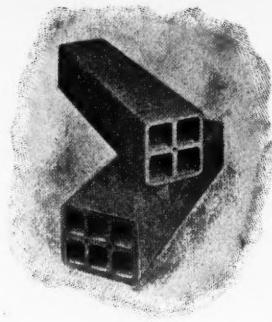
Ingersoll-Sergeant Steam Driven
Class "H" Air Compressor.

We make 40 Styles and 300 Sizes of Air Compressors. Over 35,000 of our Rock Drills in use.

American Vitrified Conduit Company,
VITRIFIED SALT GLAZED UNDERGROUND
AND INTERIOR CONDUITS.

Contractors for Complete Installation of Conduit Systems.

General Office: 39-41 Cortlandt Street, NEW YORK.
 Long Distance Telephone, 128 Cortlandt.



THURBER Street Paving Brick and Building BRICK

Also SIDEWALK TILE Manufactured by

Texas and Pacific Coal Company

Prices and Samples on Application Correspondence Solicited
 ADDRESS
 ARTHUR S. GOETZ, General Sales Agent, FORT WORTH, TEX.

OUR vitrified Paving Brick has the reputation of being equal to any manufactured in this country. Contractors and Architects specify THURBER BUILDING BRICK as a Standard. *



Works at THURBER, TEXAS
 General Sales Office,
 FORT WORTH, TEX.

JAMES JONES, Chairman Board of Managers
 DAVID G. JONES, President
 WILLIAM I. JONES, Secretary

CAPITAL, \$1,000,000

JOHN H. JONES, Treasurer
 THOMAS P. JONES, Vice-President
 HARRY P. JONES, Gen. Manager

Pittsburg & Buffalo Company

CAPACITY OF MINES
 2,000,000 TONS ANNUALLY

CAPACITY OF BRICK WORKS
 10,000,000 ANNUALLY

MINES

Johnetta Mines, Johnetta, Pa., P.R.R.
 Hazel Mines, Canonsburg, Pa.,
 P. C. C. & St. L. R. R.
 Blanche Mines, Anderson, Pa.,
 B. & O. R. R.
 Bertha Mines, Bruce, Pa.,
 B. & O. R. R.

Miners, Manufacturers and Shippers of
 STEAM, GAS AND DOMESTIC

COAL-COKE
PAVING--BRICK--BUILDING
Sewer Pipe, Hollow Block

via All Railroads Centering Pittsburg, Pa., and Buffalo, N. Y.
 Individual cars.

GENERAL OFFICES
 PARK BUILDING, PITTSBURG, PA.

BRANCH OFFICE
 PRUDENTIAL BUILDING, BUFFALO, N. Y.

North American Paving Company

CONTRACTS FOR

Asphalt Pavements and all kinds of Water-proof Construction. All Work Fully Guaranteed.

Public and Private Improvements.

Municipalities, Corporations, Individuals.

United States, Canada, Mexico.

Lowest Prices, Superior Quality, Experienced Specialists.

Ample Capital, Unsurpassed Facilities.

Genuine AMERICAN ASPHALT ROCK Exclusively.

It is the oldest and best of all Asphalt Construction.

It has endured perfect for ages under all circumstances.

Its surface is ideal, neither slippery nor soft.

It is absolutely without requirement of repairs.

Progressive alert people will not continue to accept inferior costly artificial substitute mixture.

The Genuine Asphalt Rock now obtainable.

Public Sentiment will not permit Public Officials to sacrifice or disregard Public Interests in municipal improvements.

CORRESPONDENCE SOLICITED.

NORTH AMERICAN PAVING COMPANY

Suite No. 708, 171-173 La Salle Street, CHICAGO

Capacity
40,000 tons per year.

REFINERS OF
ANTI-TRUST

GLOBE ASPHALT CO., 99.6 per cent. Bitumen
"OBISPO" BRAND **CALIFORNIA**
200,000 Square Yards **ASPHALT** LIQUID AND SOLID
Pavement laid in 1900.

ADDRESS ALL INQUIRIES
405 BLAKEWELL BUILDING, PITTSBURG, PA.

Bermudez Lake Asphalt IS THE PUREST



AND IS
Unexcelled for Reservoir Lining,
Waterproofing, Insulating
Purposes, Paint, Etc.

NEW YORK & BERMUDEZ COMPANY,
11 BROADWAY, NEW YORK.

WARREN'S BITUMINOUS MACADAM WATER-PROOF PAVEMENT

WHAT IS IT?

IT IS THE BEST LOW-PRICED PAVEMENT IN THE WORLD TO-DAY.

WHY?

1st. BECAUSE it is made of hard stone (the most durable of materials) cemented together with a flexible and very durable bituminous mortar, forming a solid waterproof bituminous concrete. The proportions of the bituminous cement and of the several sizes of particles of stone are such that, when compressed, the mineral aggregate has the greatest possible density and the least possible voids, with each particle thoroughly coated and the voids thoroughly filled with the bituminous cement.

WARREN'S PURITAN BRAND BITUMINOUS MACADAM COMPOSITION

—the natural stone takes the wear and the bituminous mortar binds the particles together.

2d. BECAUSE it affords the best surface ever devised for horses' feet, affording nearly as smooth a surface as the ordinary asphalt pavement and one which is more flexible and elastic, and which, therefore, affords a better foothold and makes a more noiseless pavement.

A WELL LAID CRUSHED STONE MACADAM PAVEMENT SEEKS GOOD ENOUGH WHEN NEW, BUT YOU CAN NOT KEEP IT SO.

WHY?

1st. BECAUSE it is not waterproof and rain washes tons of it away.

2d. BECAUSE traffic soon grinds it into powder and the wind blows tons of it into adjoining yards and houses.

3d. BECAUSE the particles of stone are only partially bound together with finer particles of stone, so that traffic early displaces the stone and causes the surface of the pavement to wear into ruts and holes.

4th. BECAUSE it cannot be cleaned with a street sweeper, which will only remove a portion of the mud and plaster the balance on the surface.

5th. BECAUSE if there is any considerable traffic all the above causes make the pavement very costly to maintain.

ON THE OTHER HAND.

WARREN'S BITUMINOUS MACADAM WATERPROOF PAVEMENT is like tough rubber, and each piece of stone or sand used in the wearing surface is incased in bitumen, and the whole is welded together into one homogenous flexible concrete.

WATER CANNOT WASH IT AWAY.

WIND CANNOT BLOW IT AWAY.

THE FLEXIBILITY OF THE BITUMINOUS MORTAR PROTECTS THE STONE; PREVENTS IT BEING GROUNDED INTO POWDER AND GIVES IT THE MOST FAVORABLE CONDITION POSSIBLE FOR RESISTANCE TO WEAR OF TRAFFIC.

IN OTHER WORDS, IT IS A CONCRETE.

An asphalt pavement surface is composed of a bituminous MORTAR (sand and bituminous cement).

Ours is a bituminous CONCRETE—i. e., particles of crushed stone cemented together with a flexible bituminous mortar compressed with a very heavy steam roller into a solid mass with no interstices or voids, and the particles of stone firmly held together with a rubbery waterproof cement that causes the whole mass to be both resistant and elastic.

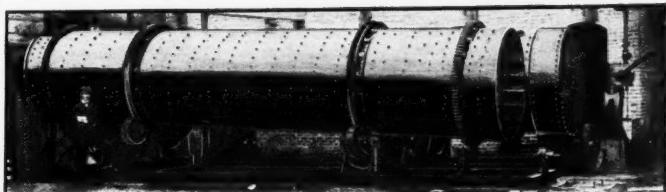
Write for illustrated pamphlet and for any further information desired.

WARREN BROTHERS COMPANY

143 FEDERAL STREET, - - - - - BOSTON, MASS.

MEACHAM & WRIGHT,
Manufacturers Agents
for : : : : : UTICA HYDRAULIC CEMENT,

920 and 921 Chamber of Commerce Building, CHICAGO.



William B. Ruggles, Pres. Robert G. McGann, Vice-Pres. J. R. Coles, Sec. & Treas.

Ruggles-Coles Engineering Co.

CONSULTING AND CONTRACTING ENGINEERS

THE RUGGLES-COLES DRYER FOR ALL MATERIALS

GUARANTEED CAPACITY AND ECONOMY

Installation of Complete Steam and Electric Plants.
Boilers, Stacks, Tanks, Plate Iron Work.

Old Colony Bldg., Chicago

39 Cortlandt St., New York



HOOKE'S

Combined Fire-Wagon and Asphaltic Mixture Heater.

(Patented April 2, 1901.)

These Heaters successfully used in
Chattanooga since October, 1900.

ROBT. HOOKE, Chattanooga, Tenn.

BY the use of this Heater,
cities may repair their own
Asphalt Pavements, re-heating
and using old material.

Three men may, in two hours
notice, repair a break in the
pavement covering an area of
3 to 5 square yards.

WRITE FOR CIRCULAR
AND PRICES.

THE USE OF PORT HURON ROAD MACHINERY

Reduces the Cost of Building Macadam (and other) Roads Very Materially.

Road Rollers

Dirt Elevating
Graders

Sprinkling Wagons



DUMP CAR WITH SPREADING ATTACHMENT.
Automatically spreads the road with any required depth of stone or gravel.

IF YOU ARE INTERESTED, WRITE US.

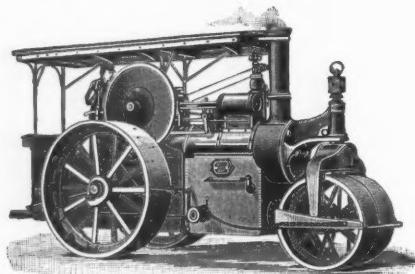
Port Huron Engine & Thresher Co., Box L, Port Huron, Mich.

The O. S. Kelly Co.

SPRINGFIELD, OHIO.



Steam Road Rollers

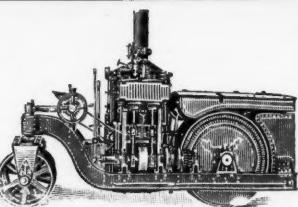
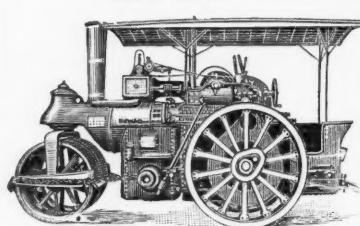


Steam Asphalt Rollers

Steam Rollers

FOR

Asphalt, Macadam, Gravel
and Turf.



Julian Scholl & Co.

126 Liberty St.

NEW YORK, N. Y.

Send for Catalogues.

The Broughton Mixer

The latest improved machine for
mixing Plaster, Limes and
Cements THOROUGHLY.

MANUFACTURED BY

Alexander, Bradley & Dunning,
SYRACUSE, N. Y.

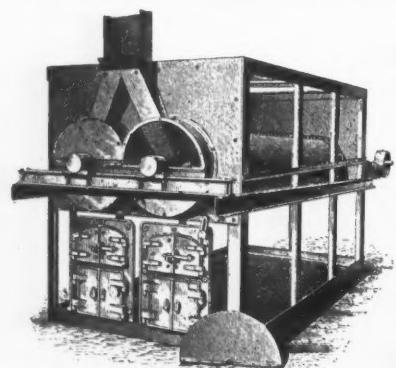
PIONEER IRON WORKS

Established 1866

Manufacturers of Every Description of

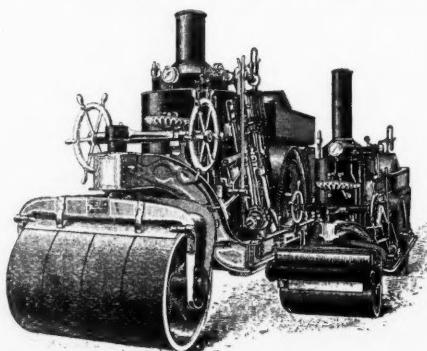
ASPHALT AND CONCRETE TOOLS AND MACHINERY

Of the Most Improved Types

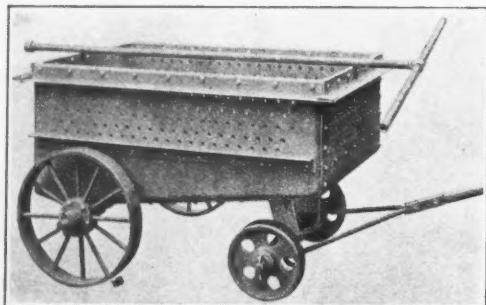


Pioneer Stationary Drier Framing (1899)

145-163 William Street,
.....BROOKLYN, N.Y.



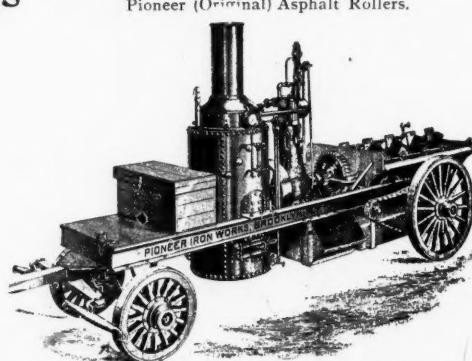
Pioneer (Original) Asphalt Rollers.



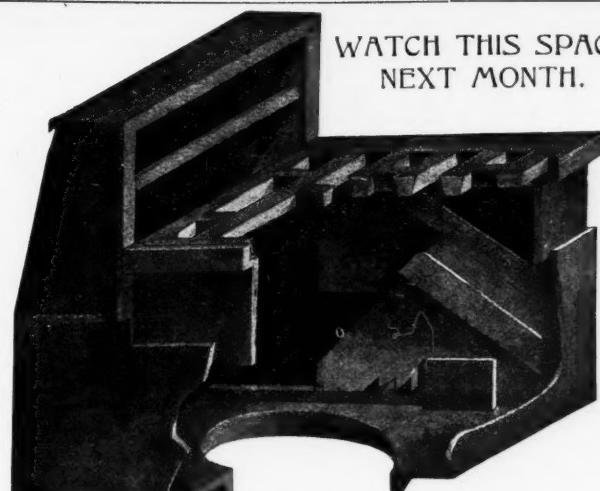
Pioneer Asphalt Tool Heater. Design of 1900.

Our Illustrated
Descriptive Catalogue
should interest you.

We will gladly mail
it on request.



Pioneer Portable Concrete Machine. (1901)



WATCH THIS SPACE
NEXT MONTH.

SEWER INLET STYLE "D."

"STANDARD ADJUSTABLE"
CATCH-BASIN, INLET AND MANHOLE
CASTINGS.

MADE BY

The American Municipal Supply Co.

26½ South Water Street, CLEVELAND, O.

A CARD WILL BRING OUR CATALOGUE.



If You Are

Building Duct Lines,
Setting Poles in Concrete,
Making Cement Sidewalks,
Putting in Paving Base, or
Doing any other Concrete
Work on a Street

You Should Be Using
^{TRADE}
Dromedary Mixers
^{MARK}
For Concrete

The Dromedary was developed on just such work. There is nothing equal to it ON A STREET, and it can go wherever a cart can go. It takes the place of the Mixing Platform, the Wheelbarrow, most of the plank, and many of the tools of the ordinary outfit. It is handy to get about with. It puts the work of **both the Mixers and the Wheelers ON A HORSE**, and dumps automatically.

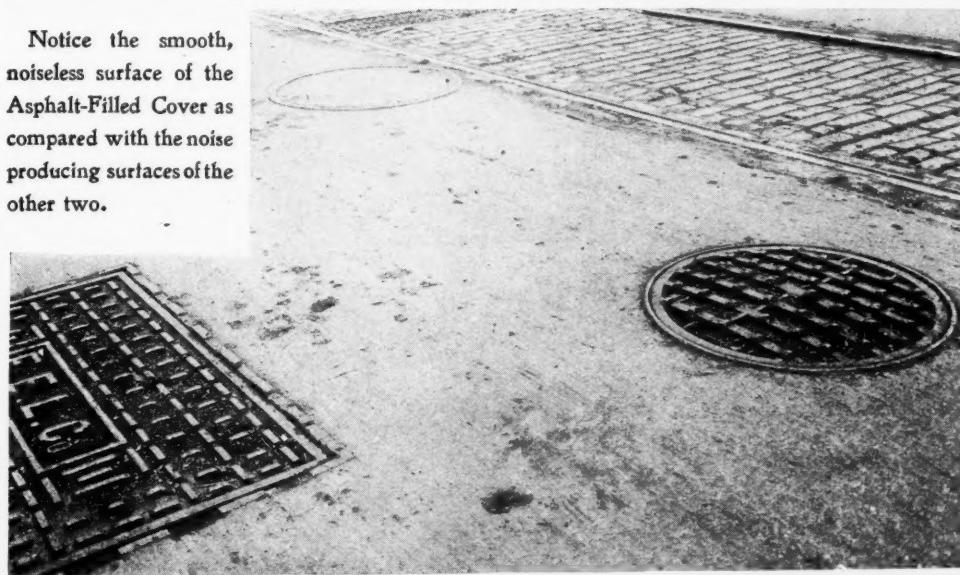


DUMPED.

*Fisher &
Saxton Co.
123 G St. Northeast
Washington, D. C.
U. S. A.*

NOISELESS ASPHALT FILLED COVERS.

Notice the smooth, noiseless surface of the Asphalt-Filled Cover as compared with the noise producing surfaces of the other two.



We make all kinds of Iron Covers and Frames, Inlet, Catch Basin and other Castings required in sewer and similar kinds of work and we make them right. ☺ ☺

IF smooth, handsome, noiseless pavements are desirable, why not accessories with the same properties? The Noiseless Asphalt-Filled Manhole Covers and Frames made by this Company have these properties. We guarantee the Filling to last as long as the pavement.

Pavements do not cut out around them. Horses do not slip on them.

They are absolutely noiseless, and they preserve the uniform continuity of the surface of the pavement in smoothness and color.

GREGER MANUFACTURING CO., Philadelphia, Pa.

WOODEN PAVEMENTS

(Creo-Resinate Process)



BOYLSTON STREET, BOSTON, LOOKING TOWARD TREMONT STREET. PAVED WITH CREO-RESINATE GROOVED BLOCKS, THEREBY PROVIDING JOINTS TO GIVE INCREASED FOOT HOLD ON A GRADE.

LAID ON A CONCRETE FOUNDATION, THEY FORM THE VERY BEST PAVEMENT FROM EVERY POINT OF VIEW, THAT IT IS POSSIBLE TO LAY. . .



INTERSECTION OF SCHOOL AND TREMONT STREETS, BOSTON, IN FRONT OF PARKER HOUSE. CREO-RESINATE WOOD PAVEMENT LAID IN SUMMER OF 1900.

SAMPLES AND ESTIMATES FURNISHED ON REQUEST. ADDRESS

The United States Wood Preserving Company

29 BROADWAY,

NEW YORK CITY

ENGINEERS AND CONTRACTORS ENGAGED IN MUNICIPAL WORK.

IOWA ENGINEERING CO.CIVIL, HYDRAULIC AND SANITARY
ENGINEERSCHAS. P. CHASE 410-411 Weston Block
Mgr. Clinton, Iowa
SPECIALTIES: Water-Works, Sewerage and Sewage Disposal**EMIL KUICHLING, C. E.**
Member of Am. S. C. E.**CONSULTING ENGINEER**Plans for Public Water Supplies, Steam and Hydraulic Powers and Electric Power Transmissions.
Rochester, New York.**EUGENE A. McMURRAY****CIVIL ENGINEER**Water Works, Sewers, Pavements, Buildings, etc.
Development of Towns and Suburban Properties
22 Clinton Street, Newark, N. J.
Telephone: 408 Newark**WISE & WATSON**CIVIL AND CONSULTING
ENGINEERSCOLIN R. WISE, ROBERT M. WATSON,
City Surveyor of Borough Engineer of
Passaic, N. J. Rutherford, N. J.
Passaic National Bank Building, Passaic, N. J.**J. T. FANNING****CONSULTING ENGINEER**

M. Am. Soc. C. E.

330 Hennepin Avenue, Minneapolis, Minn.
Plans for Public Water Supplies, Steam and Hydraulic Powers and Electric Power Transmissions.**J. JAMES R. CROES**M. Am. Soc. C. E., M. Inst. C. E.
CONSULTING ENGINEERWater Supply, Sewerage, Expert Testimony, Valuations.
Morris Bldg., 68 Broad Street, New York City.**HOLLAND & CO.****CONTRACTORS**493 West Broadway, New York
E. HOLLAND M. H. WHALEN E. V. HOLLAND

RESPONDS TO CALLS ANYWHERE.

J. W. HOWARD, Consulting Engineer, 1 Broadway, New York.
MUNICIPAL IMPROVEMENTS,

*Also Pavements of all kinds, including
the Various Asphalts.* *



Reports on Asphalt, Lead and Zinc Properties.
Estimates, Specifications, Analyses, Tests.

ENGLISH, FRENCH, GERMAN, SPANISH.

INDEX TO ADVERTISERS ON PAGE 6.

S. S. SUGAR,
189 Broadway,
New York.

SEND NAME AND ADDRESS AND RECEIVE IN EXCHANGE A USEFUL TWELVE INCH RULER.

**SOLICITOR OF UNITED STATES AND FOREIGN
Caveats, Designs, Trade Marks, Copyrights, etc.
PROMPT AND EXPERT SERVICE.**

If you desire an opinion on your invention or any information relating to patents, etc., write me and I will advise you free of cost.

PATENTS



ROBERT A. KEASBEY.
HEADQUARTERS FOR HAIR FELT MINERAL WOOL.
ASBESTOS PAPERS BRINE PIPE COVERINGS, ETC.
83 WARREN ST.
New York City.

ESTIMATES FURNISHED
CONTRACTS EXECUTED

TELEPHONE CALL
1515 CORTLANDT

GEO. S. TERRY, President.
JOHN CHISTER ENO, Vice-Pres.
WM. H. KIMBALL, Treas.

OREL D. ORVIS, Gen. Manager.
FRDERICK G. CALHOUN, Gen. Supt.
WILLIAM A. WILLIAMS, Secretary.

The Orvis Down DraftBoiler and Furnace.

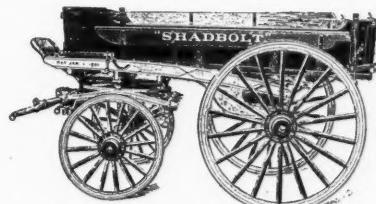
**SMOKE CONSUMING, FUEL ECONOMIST,
AND INCREASED STEAM EFFICIENCY.**

Does away with all Smoke with any kind of Bituminous Coal.

THE ORVIS DOWN DRAFT BOILER AND FURNACE COMPANY.
277 BROADWAY, NEW YORK.
Telephone, 589 FRANKLIN.

"Every man connected with the government of the city, and every citizen who believes the city should be made a beautiful, healthful and convenient place in which to live, ought to subscribe to the MUNICIPAL JOURNAL AND ENGINEER, and study it after he gets it."—*Nashville American.*

"During the time we have advertised in your Journal, we have received more inquiries than from all other papers in which our advertisement appeared. These inquiries are not idle letters, but are direct from the heads of municipalities and contractors who mean business."—*U. S. Street Cleaning Co.*



SHADBOLT

New Patent Dumping
WAGONS



For carrying Asphalt, Brick, Coal, Garbage, Ashes, Sand, Gravel,

OR ANY SUBSTANCE THAT CAN BE UNLOADED IN BULK

are simple in construction as an ordinary farm wagon. The load is properly distributed over the two axles and may be tilted at any angle desired for unloading without shifting the body in the least. Angle of elevation is entirely under control. No rollers, racks, tracks or levers used. Numbers of our wagons in use that are carrying 4½ tons of asphalt easily drawn by two horses. They save their cost in a short time in comparison with any other dumping wagon.

Write for printed matter and full particulars.



Shadbolt Mfg. Co.,

68 Flushing Avenue,
Brooklyn, New York.

Established 1853.



TWENTY-FIVE
BILLION DOLLARS
—OF—
Incorporated Capital
IS REPRESENTED IN THE
1901 EDITION
—OF—
Moody's Manual of Corporation Securities
NOW READY FOR DELIVERY



HIS PUBLICATION is a GIANT REFERENCE BOOK of nearly 1,800 pages, embracing information on practically all the INDUSTRIAL, GAS, ELECTRIC LIGHT, ELECTRIC RAILWAY and STEAM RAILROAD Corporations in the United States, Canada and Mexico.

The magnitude of the field covered is indicated by the fact that the aggregate par value of the securities described approximates \$25,000,000,000. Each corporation is completely described as to property owned and controlled, capital stock and bonded debt, dividends paid, financial condition and earnings, officers and directors, office addresses, etc. MOODY'S MANUAL IS THE ONLY PUBLICATION IN THE WORLD COVERING THE ENTIRE FIELD OF AMERICAN CORPORATE ENTERPRISE IN THIS THOROUGH MANNER.

The Manual has become the standard publication of the financial world for general reference. It is indispensable for the banker, broker and investor, as well as for all who are in any degree interested in corporation finance, or the general evolution and growth of twentieth century industrial conditions.

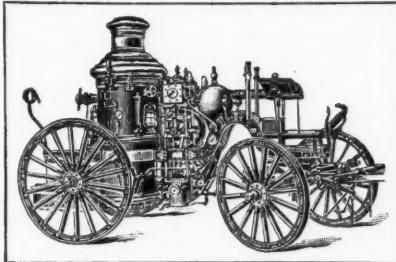
Price, handsomely bound in cloth, \$7.50 per copy. In full flexible leather, \$10.00 per copy. Express charges prepaid in the United States, Canada and Mexico.

JOHN MOODY & CO., Publishers
35 Nassau Street ◊ ◊ ◊ NEW YORK CITY

THE AMERICAN PISTON AND ROTARY STEAM FIRE ENGINES.

The Standard for Quality and Service.

2,300 ENGINES IN USE.



Also Hose Carriages and Carts, Heaters, Steam and Power Fire Pumps, and Fire Department Supplies of all kinds.

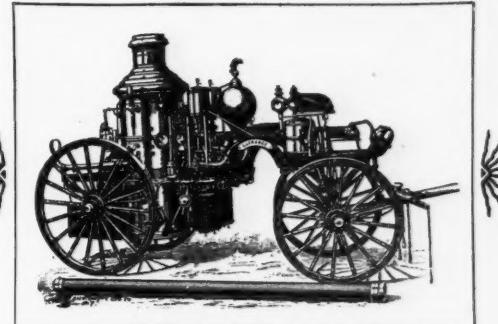
Illustrated Catalogue Free on Application.

American Fire Engine Co.,

CINCINNATI, O.

SENECA FALLS, N. Y.

The La France Fire Engine Co., Sole Manufacturers of The LA FRANCE PISTON and ROTARY Steam Fire Engines.



HAYES

Patent Extension Hook and Ladder Trucks and Fire Escapes.

Heaters and Fire Department Supplies.

SEND FOR CATALOGUE.

ELMIRA, N. Y.

The Gamewell Fire Alarm Telegraph Co.

Manufacturers of

FIRE ALARM AND POLICE SIGNAL TELEGRAPHS

for Municipalities.

Particular Attention is called to our Storage Battery and Controlling Boards.

SCIENTIFIC, PRACTICAL, ECONOMICAL. THEY HAVE DEMONSTRATED THEIR GREAT SUPERIORITY OVER PRIMARY BATTERIES.

Executive Offices, 19 BARCLAY ST., NEW YORK.

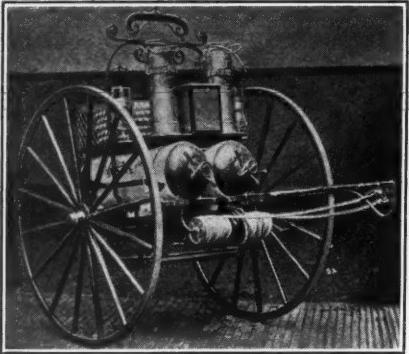
Cannot get out of Repair.



Telephone,
1245 FRANKLIN.

*Hand and Horse
Chemical Engines.
Combination
Wagons.*

REX FIRE EXTINGUISHER COMPANY.



145 CENTRE STREET,
NEW YORK.

Throws a Stream 50 Feet.



*Hand Extinguishers,
Fire Escapes,
Fire Department
Supplies.*

FOR TOWNS, FACTORIES, COUNTRY AND CITY HOMES.

Sealed Acid Bottle.

Loose Stopple Acid Bottle.



DIGGS-UPRIGHT FIRE EXTINGUISHER
DOES NOT REVERSE TO DISCHARGE

Unequalled in Efficiency. Unexcelled in Construction. Every Machine Tested to 400 Pounds. No More Broken Glass, Bottle Perfectly Sealed.

**NO DETERIORATION OF THE STRENGTH OF ACID.
BOUGHT ON ITS MERITS BY THE BEST HOUSES.**

I refer to a few of them here, viz.: {
 Messrs. Tiffany & Co., Factory, Forest Hill, N. Y.
 Messrs. J. B. & J. M. Cornell Iron Works, Cold Springs, N. Y.
 Edison Phonograph Works, Orange, N. J.
 New Amsterdam Hotel, 21st St. and 4th Ave., New York.
 Adopted by the U. S. Army Transport Service, New York.

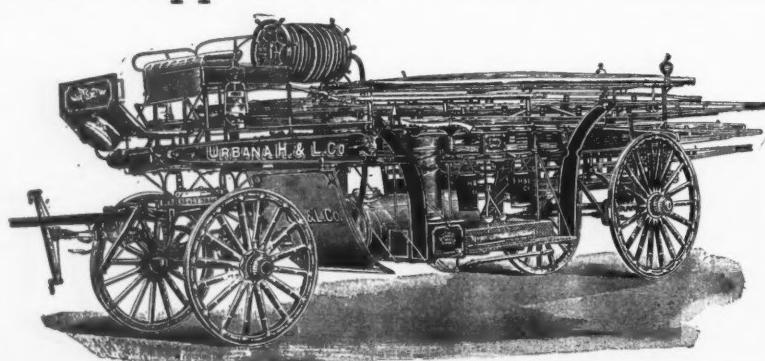
Manufactured by D. W. DIGGS, 143 Centre St., New York.
TELEPHONE, 1166 FRANKLIN.

PATENTED MAY 15 AND JUNE 19, 1900

THE SEAGRAVE COMPANY

COLUMBUS, OHIO, U. S. A.
MANUFACTURERS OF

Fire Apparatus, Trussed Ladders and Equipments, Etc.



Not Members of Any Trust.

City and Village Councils and purchasing committees are hereby cautioned that all purchasers or manufacturers of infringements on any or all of the following Foreign and United States Patents on Trussed Ladders and Equipments are alike liable to the Patentee for damages.

347,648 August 17, 1886.	631,541 September 5, 1899.	669,711 March 12, 1901.	60,396 June 21, 1898.
357,417 February 8, 1887.	607,665 July 19, 1898.	64,139 September 30, 1899.	25,621 December 27, 1886.
581,776 May 4, 1898.	814,499 April 18, 1899.	64,080 September 19, 1899.	70,098 February 5, 1901.
607,664 July 19, 1898.	287,967 April 18, 1899.	62,665 February 16, 1899.	70,099 February 5, 1901.
613,848 November 8, 1898.	287,968 April 18, 1899.	63,167 May 29, 1899.	69,673
625,066 May 16, 1899.	666,441 January 20, 1901.	61,433 October 19, 1898.	69,674
	666,442 January 20, 1901.	62,664 February 16, 1899.	

NEW YORK OFFICE, 59 PARK PLACE.



Eureka Fire Hose Company,

No. 13 Barclay Street, NEW YORK.

The Original and Largest Manufacturers of

RUBBER LINED COTTON HOSE,

Sole Manufacturers of the Celebrated High Grade Brads of Seamless Woven Cotton, Mildew Proof and Rubber Lined

FIRE DEPARTMENT HOSE,

"Eureka," a Triple Hose. "Paragon," a Double Hose. "Red Cross," a Single Hose.
MANUFACTURERS OF HOSE OF EVERY DESCRIPTION.

JACKET FIRE HOSE IN KNITTED OR WOVEN FORM.

FIRE EXTINGUISHER MANUF'G CO.,

325 South Desplaines Street, CHICAGO, ILL.
BUILDERS OF

Champion Chemical Fire Engines.
Babcock Chemical Fire Engines.
Combination Chemical Engines and Hose Wagons.

Champion Fire Extinguishers.
Fire Extinguisher Charges.
Hale Water Towers.
Champion Water Towers.

Babcock Aerial Hook and Ladder Trucks.
General Service and Village Hook and Ladder Trucks.
Babcock Fire Extinguishers.

Turret Nozzles or Deck Standpipes for Lumber Yards, Factories, Warehouses and Public Buildings.

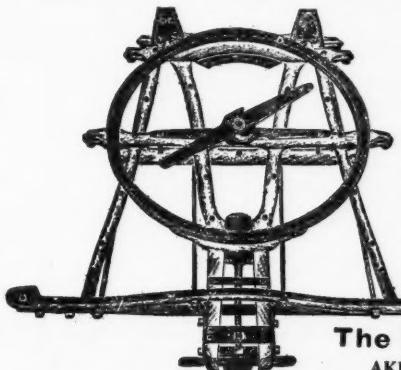
Nozzles of All Kinds.
Three-Horse Hitches.
Steck's Electric Wire Cutters.

"Eclipse" Tubular Lanterns.
Bullwinkle Quick-Hitching Snaps.
Detroit Lever Door Openers.

Ladders, Pompier Outfits, Pike Poles.
Gongs, Axes, Lamps, Sliding Poles.
Siamese, Hub Caps, Fire Bells, Buckets.

And a hundred other small supplies and specialties.

Selle's Patent Trussed Platform Giant Truck Gear.



For Fire Apparatus
and Fancy Trucks

Nos. 40 BL to 44 BH, a neat gear with scrolls and pointed bars suited for fire-hose, hook, and ladder truck, chemical fire engine and fancy merchandise truck wagons.

Correspondence
Solicited

The Selle Gear Co.
AKRON, OHIO, U. S. A.

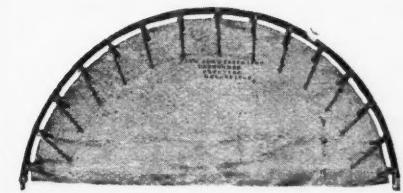
Chicago Fire Hose Co.,

54 La Salle Street, Chicago, Ill.

OUR COTTON RUBBER LINED HOSE

is seamless, making a perfectly smooth waterway, reducing "Friction Loss." Has a double calendered vulcanized lining, overcoming the possibility of a pin hole, and the adhesion of the Rubber lining is so perfect that it is practically impossible to separate it by physical force.

GET OUR PRICES AND CATALOGUE.



THE . . .
BROWDER
LIFE SAVING
NET.

Adopted in New York
City, Jersey City,
Columbus, Chicago
and other places.

PRICE, \$100.00

The Springs and Hangers counteract the effect ordinarily produced by leaping into the net. There is consequently no jar to the persons jumping or to those holding the net. There is no rebound. Fire Departments, Factories, Hotels, etc., use these nets.

T. F. BROWDER & CO., Greenfield, Ohio

Please mention this publication.

"A land of fruits and flowers."

CALIFORNIA.

Affords every variety of scenery and climate; abounds in mountains, lakes, rivers and forests. Every American should know something about it. The way to reach it—go by the

NEW YORK CENTRAL LINES.

A copy of the 40-page Illustrated Catalogue of the "Four-Track Series," New York Central's books of travel and education, will be sent free, post-paid to any address on receipt of a postage stamp, by George H. Daniels, General Passenger Agent, New York Central & Hudson River Railroad, Grand Central Station New York.

Knickerbocker Special South-Western Limited

Two famous vestibuled trains that run daily between New York and Cincinnati, Indianapolis, St. Louis, and other Western points

— V I A —
**Big Four
Route** and
New York Central and
Lake Shore Routes

::: Cafe, Library, Dining and Sleeping Cars :::

M. E. INGALLS, President & **WARREN J. LYNCH**, Gen. Pass. Agt.
W. P. DEPPE, A. G. P. A., Cincinnati

The LAKE SHORE and Michigan Southern Railway. 00000



Is the only double-track line between Chicago and Buffalo. It is the most interesting route between Buffalo and the West and Southwest, traversing the richest and finest portion of the Middle States.

In the opinion of experienced travelers it has no superior in perfectness of roadbed, punctuality and elegance of service, and the comfort and care of its patrons.

See that your tickets read by
The Lake Shore
A. J. SMITH,
Gen'l Pass. & Ticket Agent,
CLEVELAND, O.

C. H. & D. Ry.

CINCINNATI, INDIANAPOLIS, CHICAGO,

TOLEDO, DETROIT.

Compartment Sleeping Cars. Cafe Dining Cars. Finest Trains in Central States.

D. G. EDWARDS, Pass. Traffic Manager, 00000 CINCINNATI, OHIO.

ERIE RAILROAD

"Picturesque Trunk Line of America"

DIRECT LINE FROM
NEW YORK, CLEVELAND
CINCINNATI, CHICAGO

And Intermediate Points
to the WONDERFUL

FALLS OF NIAGARA

SOLID VESTIBULED TRAINS
With Sleeping, Dining and Cafe Cars

PROTECTED EVERYWHERE BY
BLOCK SIGNALS

MAGNIFICENT SCENERY

D. W. COOKE, Gen'l Pass'r Agent, NEW YORK

LITTLE DROPS OF WATER
LITTLE LUMPS OF COAL
MAKE THE MIGHTY POWER
THAT MAKES THE ENGINE ROLL
ON THE LACKAWANNA
AS EVERYBODY KNOWS
THIS COAL IS OF ANTHRACITE
AND SO THE TRAVEL GROWS



HARD COAL MEANS NO SMOKE NO DUST.

SOLID VESTIBULED TRAINS BETWEEN
NEW YORK, BUFFALO, CHICAGO, ST. LOUIS.

For Information, Rates etc.
429 & 1183 B'WAY, NEW YORK.
289 MAIN STREET, BUFFALO.
103 ADAMS STREET, CHICAGO.
8TH & OLIVE STREETS, ST. LOUIS.

The CONTRACTOR'S TOOL COMPANY

118 S. Sixth St., PHILADELPHIA, PA.

Machinery and ToolsFor Pavers,
Cement Workers,
Roofers....

Sole Controlling Agent for Allen's Indicator Gauge Glasses.

S. C. STROCK, 11 Broadway,
NEW YORK**Poles, Ties and Timber.**Octagonal and Square Sawn Tapering Poles,
Round Poles, Ties, Switch Sets and other Dimension Stock for Electric, Steam and Traction Railroads, Telephone, Telegraph and Electric Light Companies. Telephone, 488 Bro-Contractor's
Drainage
Sewerage**PUMPS**

Handling Dirty, Gritty and Sandy Liquids without Wear, Oil or Care. Pumping Outfits for Contractors, Mining, Irrigating, Railroad, Quarry, Drainage and Manufacturing purposes. Second hand Engines, Boilers, Pumps and other Machinery always on hand. Exchanging.

MASLINS, 165-167 First St., Jersey City, N. J.

**RUBBER
COTTON, etc. HOSE**

Fire, Lawn, Garden, Precautionary or other; with full Rubber Line.

Temporary or permanent agencies offered. Free samples. Cash Commissions.

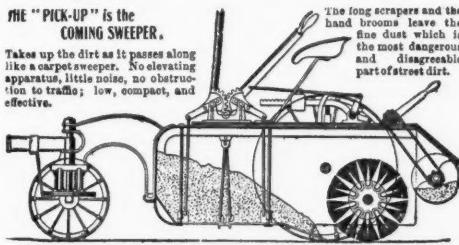
\$5.00 Reward for first information of Fire Hose wanted.

MINERALIZED RUBBER CO.

18 CLIFF STREET, NEW YORK.

THE "PICK-UP" is the
COMING SWEEPER.

Takes up the dirt as it passes along like a carpet sweeper. No elevating apparatus, little noise, no obstruction to traffic; low, compact, and effective.

The Ironclad Two-Horse Street-Sweeping Machine
ADDRESS H. B. WALKER, 208 S. PINE ST., DAYTON, O.**PATENTS**

Quickly secured. OUR FEE DUE WHEN PATENT OBTAINED. Send model, sketch or photo, with description for free report as to patentability. 48-PAGE HAND-BOOK FREE. Contains references and full information. WRITE FOR COPY OF OUR SPECIAL OFFER. It is the most liberal proposition ever made by a patent attorney, and EVERY INVENTOR SHOULD READ IT before applying for patent. Address:

H. B. WILLSON & CO.
PATENT LAWYERS,
LeDroit Bldg., WASHINGTON, D. C.

PLEASE MENTION

**..MUNICIPAL..
JOURNAL AND ENGINEER**WHEN WRITING
TO ADVERTISERS

INDEX TO ADVERTISERS ON PAGE 6.

Buyer's Directory.

For Index to Advertisements, See Page 6.

Conduits.American Vitrified Conduit Co.
Gest, G. M.**Contractors.**Burgard, H. P.
Gest, G. M.
Gregory, Eliha.
Holland & Co.
Miller & C., J. P.
Moore, E. F.
Ruggles-Cole Engng Co.**Contractors' Tools.**

Contractor's Tool Co.

Covers, Manhole, Catch Basin and Inlet.Am. Municipal Supply Co.
Greger Manfg. Co.**Curbing, Steel Edge.**

Steel Protected Concrete Co.

Door Checks and Springs.

Ogden Manfg. Co.

Dredging.

Atlantic Gulf & Pacific Co.

Electric Lamps.

General Electric Co.

Electric Light and Power.

General Electric Co.

Filing Devices.Art Metal Construction Co.
Yawman & Erbe Mfg. Co.**Filters.**

(See Water Filters.)

Fire Dept. Supplies.American Fire Engine Co.
Chicago Fire Hose Co.

Clark Co., W. J., The.

Fabric Fire Hose Co.

Fire Extinguisher Mfg. Co.

La France Fire Engine Co.

Rex Fire Extinguisher Co.

Seagrave Co., The.

Fire Escapes.

Rex Fire Extinguisher Co.

Fire Extinguishers.Diggs, D. W.
Fire Extinguisher Mfg. Co.

Rex Fire Extinguisher Co.

Brick, Paving, Building and Sewer

Hooke, Robt.

Orvis Down Draft Boiler & Furnace Co.

Boilers.

Orvis Down Draft Boiler & Furnace Co.

Boiler and Pipe Coverings.

Keasbey, Robert A.

Bonds, Rail.

Wendell & MacDuffie.

Brakes, Air.

Christensen Engng. Co.

Brick, Paving, Building and Sewer

New York Brick & Paving Co.

Pittsburg & Buffalo Co.

Texas & Pacific Coal Co.

Bridges.

Scherzer Rolling Lift Bridge Co.

Car Fenders.

Consolidated Car Fender Co.

Castings.

Am. Municipal Supply Co.

Greger Mfg. Co.

Car Wheels.

Wendell & MacDuffie.

Cement.

Meacham & Wright.

Warren Brothers Co.

Cement and Lime Mixers.

Alexander, Bradley & Dunn.

Fisher & Saxton Co.

Cement Dryers.

Pioneer Iron Works.

Ruggles-Coles Engng. Co.

Chemical Engines.

Fire Extinguisher Mfg. Co.

Rex Fire Extinguisher Co.

Civil, Consulting and Constructing Engineers.

Christian, G. L.

City Wastes Disposal Co.

Croes, J. J. R.

Chas, G. Darrach.

Fanning, J. T.

Chas. A. Hague.

John J. Hainsworth.

Hering, Rudolph, & Geo. W.

Fuller.

J. W. Howard.

Iowa Engineering Co.

Kuichling, Emil, C. E.

McMurray, Eugene A.

Jos. B. Rider.

Tingley Co., R. H.

Wise & Watson.

Concrete Machinery.

Pioneer Iron Works.

Concrete Structural Work.

Pioneer Iron Works.

Warren Brothers Co.

Nozzles.

Fire Extinguisher Mfg. Co.

Patents.

Sugar, S. S.

Wilson & Co., H. B.

Poles.

Strock, S. C.

Pumps, Drainage and Sewerage.

Craft, Jesse.

Ingersoll-Sergeant Drill Co.

Maslins.

Pulsometer Steam Pump Co.

Railway Supplies.

General Electric Co.

Wendell & MacDuffie.

Road Rollers.

Kelly, O. S., Co., The.

Pioneer Iron Works.

Port Huron Engine & Thresher Co.

Scholl & Co., Julian.

Rock Crushers.

Pioneer Iron Works.

Rock Drills.

Ingersoll-Sergeant Drill Co.

Rand Drill Co.

Roofing Material.

New York & Bermudez Co.

Warren Bros. Co.

Rubber Tires.

Consolidated Rubber Tire Co.

Goodyear Tire & Rubber Co.

Sewage Disposal.

City Wastes Disposal Co.

Int. Sewage Disposal Co.

Sidewalk Paving.

Warren Brothers Co.

Snow Plows and Sweepers.

Wendell & MacDuffie.

Steam Fire Engines.

American Fire Engine Co.

La France Fire Engine Co.

Street Lamps.

Abner Acetylene Gas Co., The.

Boulevard Globe & Lamp Co.

Imperial Gas Lamp Co.

Pennsylvania Globe Gas Lt. Co.

Welsbach Street Lighting Co.

Street Sprinklers.

Port Huron Engine & Thresher Co.

Studebaker Bros. Mfg. Co.

Street Sweepers.

Studebaker Bros. Mfg. Co.

U. S. Street Cleaning Co.

Walker, H. B.

Switchboards, Fire Alarm and Police Telegraph.

Gamewell Fire Alarm Telgh. Co.

Telephones.

Ericsson Telephone Co.

Typewriters.

Smith-Premier Typewriter Co.

Wagons and Carts.

Port Huron Engine & Thresher Co.

Shadbolt Mfg. Co.

Studebaker Bros. Mfg. Co.

U. S. Sanitary Co.

Water Filters.

N. Y. Continental Jewell Filtration Co.

Water Filtration.

Int. Water Filtration Co.

Water Meters.

Buffalo Meter Co.

Builders Iron Foundry.

Pittsburg Meter Co.

Standard Meter Co.

Water Storage.

Acme Water Storage & Cons. Co.

Wires and Cables.

General Electric Co.

Okonite Co.

Wooden Pavements.

U. S. Wood Preserving Co.

THE LAYMAN AND PARPART SANITARY STREET CLEANER

HAS THREE CLAIMS UPON THE PUBLIC.

SPRINKLES,
SWEEPS AND
CARTS AWAY
THE DIRT
WITHOUT THE
AID OF
HAND LABOR.



ECONOMY,
SANITATION
AND
THE
ELEVATION
OF
LABOR.

TO THE HONORABLE STREET COMMISSIONER OF GREATER NEW YORK.

Dear Sir:—Believing as we do that by the adoption and use of the "Layman and Parpart Sanitary Street Cleaner" you can largely improve the Sanitary conditions of this City thereby materially reducing sickness, suffering and the consequent death rate, and that you can keep the streets clean sixteen hours per day at as small or smaller cost than is now required to maintain an inferior service eight hours per day, we therefore respectfully request that you immediately employ this modern and sanitary means of removing street dirt, dust and refuse, without circulating the same in the open air, which always results in discomfort and often in disease and death, as well as in soiling our clothing, goods, offices and homes.

New York Post Graduate Medical School and Hospital—Alexander H. Caudlish, Supt.—2d ave. & 20th st.
D. B. St. John Roosa, M. D., LL. D., 20 W. 30th st.
Theodore C. Janeway, M. D., 36 W. 40th st.
J. M. Lieberman, M. D., 27 W. 114th st.
Theodore K. Tuthill, M. D., 319 W. 18th st.
C. W. Kinney, M. D., 151 W. 93d st.
Bacteria Sewerage & Purification Co., 149 B'way.
A. Trowbridge (Pres. 9th Nat. Bank), 407 B'way.
Henry K. McHarg (V. P. Bank of Manhattan Co.), 40 Wall st.
Henry D. McGowan, formerly of Brown Bros., 40 Wall st.
Crawford Shoe Co., 262 W. 125th st.

W. L. Douglass Shoe Co., 433 Broadway, 974 3d ave., 220 W. 125th st.
Emerson Shoe Co., 240 B'way, 224 W. 125th st.
J. Paisley & Son, 391, 395 6th ave.
Graham Shoe Co., 32d st. & Broadway.
Higgins Shoe Co., 1295 Broadway.
Waldorf Shoe Co., 345 & 1327 Broadway.
Rogers, Peet & Co., 569, 573, 1260, 1268 B'way.
Smith, Gray & Co., 31st st & Broadway.
Hackett, Carhart & Co., 265, 267, 418, 422, 841 Broadway.
Kaskel & Kaskel, 20 W. 23d st.
Francis G. Lord (of Brooks Bros.), 936 Broadway.
Sanford & Sanford, 176 5th ave.
Wm. B. Leonard, 170 5th ave.

Keep Shirt Co., 1147 Broadway.
Acker, Merrill & Condit, 130 Chambers st.
Marvin Safe Co., 468-472 W. Broadway.
The Mosler Safe Co., 476 Broadway.
Kinsey, Rainer & Thompson, Gen'l Agts. Hall Safe Co., 392 Broadway.
Frank A. Pattison, 141 Broadway.
S. A. Cooney, 120 Liberty st.
Stern Bros., 23d st.
John Wanamaker, 784 Broadway.
Siegel-Cooper Co., 18th & 19th sts., 6th ave.
Adams & Co., 6th ave.
H. C. F. Koch & Co., W. 125th st.
D. M. Williams & Co., 3d ave. & 125th st.
Dunlap & Co., 178-180 5th ave., 181 Broadway.
John B. Stetson & Co., 750 Broadway.
Edward M. Knox, 194 5th ave.

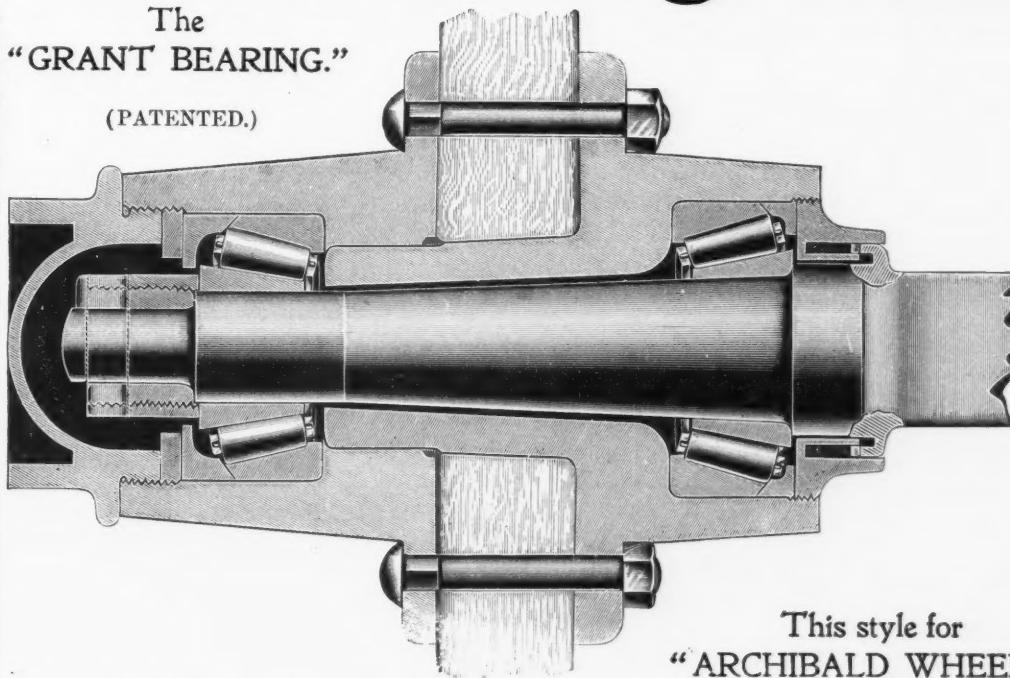
The above names are a few of the 5,000 who have signed the petition.

UNITED STATES STREET CLEANING CO.
258 Broadway, NEW YORK.

Grant Roller Bearing Axles

The
"GRANT BEARING."

(PATENTED.)



This style for
"ARCHIBALD WHEELS."

THE GRANT AXLE & WHEEL CO., SPRINGFIELD,
OHIO.

THE GREAT POPULARITY OF THE

Kelly-Springfield Two
Wire Rubber Tire

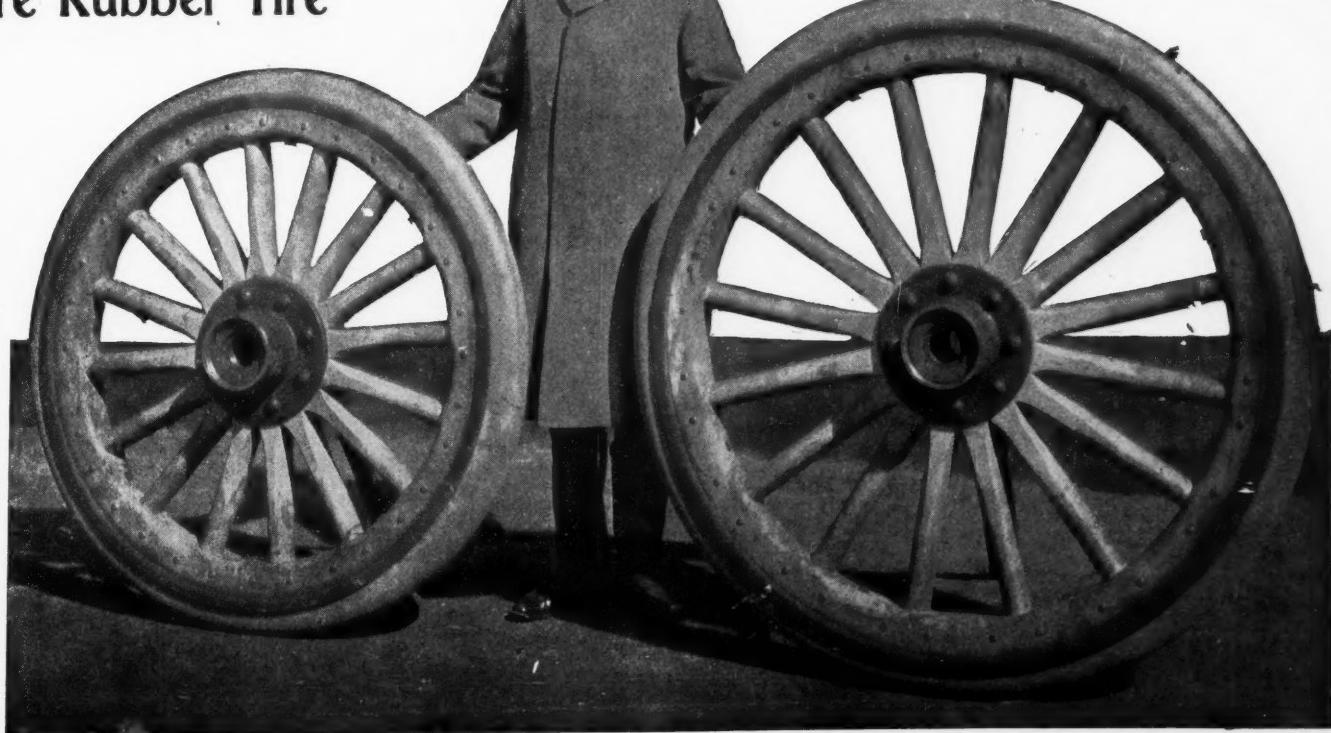
Is due to the fact that it has proven to be the best for any style vehicle.
We can successfully apply these Tires to either a Baby Carriage or a
Fire Engine.

SEND FOR CATALOGUE.

Consolidated Rubber Tire Co.

40 WALL STREET

NEW YORK



1889
PARIS.

The Standard for Rubber Insulation.

Okonite Wires.
Manson Tape.

TRADE MARK.

Sole Manufacturers:
WILLARD L. CANDEE, Managers.
H. DURANT CHEEVER, Managers.
GEORGE T. MANSON, General Superintendent.
W. H. HODGINS, Secretary.

1893
CHICAGO.

Okonite Tape, Candee Weather-proof Wire.

FABRIC FIRE HOSE CO.,

W. T. COLE, Gen. Manager.

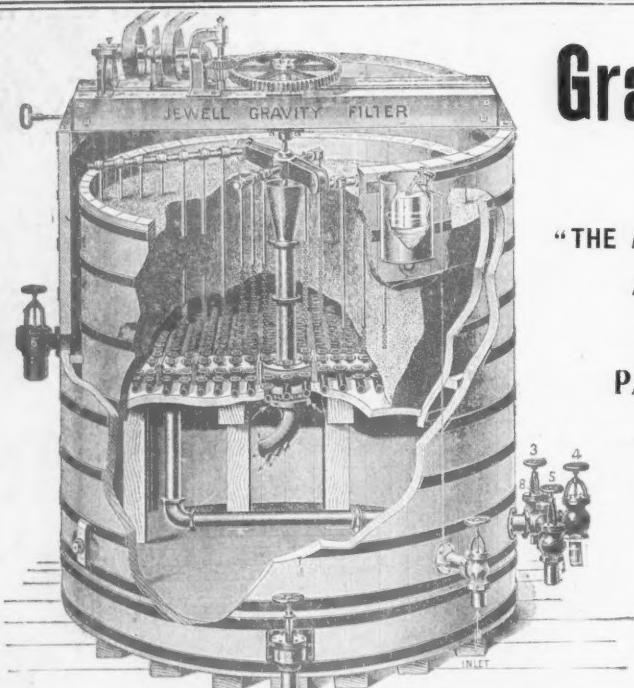
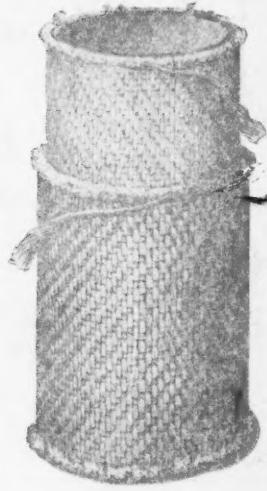
68 MURRAY STREET, NEW YORK,

PATENTEES AND SOLE MANUFACTURERS OF

**Wax and Gum Treated Fire Hose,
CARBOLIZED RUBBER HOSE.**

FIRE DEPARTMENT SUPPLIES.

Largest
Manufacturers
of
Fire Hose
in the
World.



**HIGHEST EFFICIENCY.
LOWEST PRICES.**

NEW YORK CONTINENTAL JEWELL FILTRATION CO.,

15 Broad St., New York, N. Y. 40-42 W. Quincy St., Chicago, Ill.

Gravity and Pressure Filters

Constructed under the JEWELL, WARREN & HYATT PATENTS.

"THE ACKNOWLEDGED STANDARD OF MECHANICAL FILTRATION."
ADOPTED BY OVER 148 CITIES IN THE UNITED STATES.

PATENTS SUSTAINED BY THE HIGHEST COURTS.

